JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXVII., No. 2540.—TUESDAY, JANUARY 16, 1912.

EDITORIAL NOTES—GAS, &c.

Statutory Gas Company Promotions.

IN the second article reviewing the Bills that have been lodged for the session of Parliament that will soon be upon us, the first batch of the promotions of existing statutory gas companies is dealt with; but it does not include the schemes of the greatest importance. These will fall for notice in the third article. In miscellaneous measures supplying the subject-matter for the second article, however, there are several interesting points outside the now common lines of current gas legislation.

There is the Benefit Funds Bill that is being promoted by seven gas companies. The very existence of this novel measure suggests that the opinion has arisen of late that gas companies are not within the right in granting pensions, or other allowances, payments, and benefits to their employees without express statutory power. An informative letter upon this point by Mr. W. R. Herring appeared in our "Correspondence" columns for the 5th ult. (p. 702). It is such a matter of custom to grant pensions and to make allowances to employees in connection with commercial undertakings that no doubt most companies do it without any consideration as to whether parliamentary authorization is essential. On the other hand, others have some such simple empowering clause in their Private Acts as is found in the Houghton-le-Spring Bill, which says: "It shall be lawful "for the company to make superannuation or other allow- "ances, and to pay pensions to any officers, servants, or "employees of the company who may be temporarily or "permanently disabled by sickness, infirmity, or age, and "for that purpose to apply the funds and revenues of the "company." The seven companies in question, however, have a full-blown Bill to deal with this particular question in detail, and to put the rights and powers into complete legislative harness by limiting the maximum appropriation from revenue (½d. per 1000 cubic feet sold) and the maximum amount to stand to the credit of the fund, and specifying the purposes to which the fund is to be applied, and allowing agreements to be made with insurance companies in connection therewith. The fund will be applicable to grants for, in addition to employees, widows and dependants of employees. In the event of any company making a scheme involving contributions by their servants, the scheme is not to come into operation until the company shall have been, in respect of the scheme, registered under the Friendly Societies Act, 1896. One of the promoting Companies is the Brighton and Hove; and the Town Clerk of Brighton has reported to the Corporation that the operation of the scheme would have the effect of postponing the period at which the consumers would become entitled to a reduction in the price of gas under the sliding-scale, and from this point of view the proposal is objectionable. But surely the Corporation will not seriously go before a Parliamentary Committee and advance a plea of this kind. We rather think such an action, having in view the humane purposes of the fund, would be regarded by any Parliamentary Committee in a light not very complimentary to the Corporation. The ½d. per 1000 cubic feet appropriation will not be a continuing one, after the fund is established. Only the necessary appropriation will be made to maintain the fund within the prescribed limit.

Another joint promotion is the Standard Burner Bill, in which fifteen companies are concerned. A stand-by clause in Gas Bills is becoming almost general; but we are sorry to see that there is not a more unanimous application to include electricity. Kindred is a proposal in the Houghton-le-Spring and Leatherhead Bills to obtain exemption from liability—there is precedent for this—for refusing to supply users of suction gas with town gas if the service would cause any deficiency in the neighbourhood to ordinary consumers. The Annfield Plain Gas Company, too—also with precedent in their favour—are asking for authorization to supply within their area installations of acetylene, gasoline, suction, or other gas plant where their own distributing plant is not available. Several of the companies are asking for an extension of supply limits; and, in this week's section of the review, there is the Leatherhead Company seeking the endorsement of Parliament to the purchase, under an agreement already effected, of the Cobham Gas Company. The Bognor Gas Company are requesting full electricity supply powers; while the Houghton-le-Spring Gas Company are desirous of being invested with power to apply for an Electricity Provisional Order. Several companies are now including a clause empowering the appointment of a managing-director; and invariable customs now are to prescribe professional accountants as auditors, and to give power to directors to fix the remuneration of secretaries. These are very proper changes from old-fashioned procedure, to which, in both respects, there were several patent objections. As mentioned last week, one of the companies seeking incorporation is asking for profit-sharing powers; the Annfield Plain Company among those whose promotions are dealt with to-day are doing the same. The Herne Bay Company, as mentioned last week, are desirous of securing modification of section 7 of the Gas-Works Clauses Act, 1847, by which modification it is proposed that any tunnel, arch, vault, or building, situate beneath the surface of the street shall be deemed to be a tunnel to which the provisions with respect to the breaking up of streets for the purpose of laying pipes apply, and shall not be deemed to be a building within the meaning of section 7. The Christchurch Company are proposing the same modification.

Cheap Gas Illumination at Westminster.

PHOTOMETRICAL tests and actual cheque payments between them furnish pretty good evidence of the value that ratepayers are receiving for the money they spend on the public-lighting service. In Westminster, the illumination given by the Gaslight and Coke Company being nearly double that afforded by the electricity suppliers, and the payment per annum to the Gas Company being upwards of £10,000 less than that to their competitors, there is such a huge margin in both respects in favour of the Gas Company that there can be no bickering over the figures. The fact has therefore substantial proof that the ratepayers under their present contracts are obtaining cheap illumination from the Gas Company, and relatively dear illumination from the electricity suppliers. The candle-power tests on which these statements are based were not the work of officials of the Gas Company, nor of any nocturnal illumination snapshotters from among our electrical friends. They are the official ones for which the City Engineer (Mr. J. W. Bradley, M.Inst.C.E.) is wholly responsible, and which are the ones upon which, for any defection, the Gas Company would suffer penalty under their contract. Taking the average results of the illuminating power tests for the past quarter and the total payments for the year, it is found that the ratepayers of Westminster have been paying £24,425 9s. 4d. for an average aggregate illumination from the electric lamps of 493,022 candles; while to the Gas Company for high and low pressure inverted gas-lamps giving in the aggregate 934,627-candle power, only the sum of £14,028 has been paid—that is to say, the Gas Company have given 441,605 candle power more for £10,397 less.

We will be frank and fair, and point out that, in the total of electric lamps, there is a large proportion of the old open type electric arcs. The comparables, however, are flame arc lamps and high-pressure gas-lamps on the one hand, and metallic filament lamps and low-pressure inverted incandescent gas-lamps on the other. Therefore, if we take the "Oriflamme" lamps in Whitehall (the average candle power of which was 1228 candles), it is seen, as the result of Mr. Bradley's tests, that the cost per candle power per hour was 0·00148d., or the total cost per candle per annum 5·83d.;

and in the case of the Jandus lamp (the average candle power of which was 1418 candles), the cost per candle power per hour was 0·00064d., or 2·52d. per annum. Then if we take the high-pressure gas-lamps, which gave an average illuminating power of 4118 candles, it is seen that the total cost per candle power per hour was 0·00034d., or per annum 1·23d., or only about half the cost of the best that the flame arc lamps did. If we take the high-pressure gas-lamps that give an average of 2074 candles, we have the cost per candle power per hour working out to only 0·000481d., or per candle power per annum to 1·89d. Let us turn to the Osram metallic filament lamps, and compare them with the low-pressure inverted gas-lamps. The Osrams (of a nominal illuminating power of 64 candles, each pair) gave an average illuminating power of 49 candles; and the cost per candle power per hour worked out to 0·00428d., or per candle power per annum to 16·86d. These figures have to be compared with the following for the three different units of low-pressure gas-lamps: Cost per candle power per hour, 0·001139d., 0·00133d., and 0·001415d.; or respectively per candle power per annum, 4·49d., 5·24d., and 5·57d. That is to say, the Osrams cost 16·86d. per candle power per annum, as compared with 5·57d.—the highest payment per candle power per annum for the low-pressure gas-lamps. Whichever way one examines these figures, the advantage, with much to spare, is on the side of the Gaslight and Coke Company. The margin, indeed, is of such considerable order that the facts are brought out in a manner so pronounced that no one can escape the meaning.

A word of congratulation to the Gas Company over the tale that Mr. Bradley has to tell as the results of the tests regarding the more than fulfilment of the terms of the contract. The lamps that the Company contracted should give a minimum of 3000-candle power gave an average of 4118 candles; the 1800-candle power ones, an average of 2074 candles; the 300-candle power ones, an average of 358 candles; the 180-candle power ones, 214 candles; and the 90-candle power ones, an average of 128 candles. The City of Westminster must be well content with their bargain; and the gas industry must be gratified with the independent testimony to the capabilities of modern systems of gas lighting under stringent street and testing conditions. The figures, to which attention is here called, and which are published in greater detail in other columns to-day, are an answer to certain malicious misrepresentation adopted by opposing interests.

The Gasholder Catastrophe at Ilkeston.

The gas-works of the Corporation of Ilkeston were the scene of an unprecedented gasholder catastrophe yesterday week, the actual cause of which is, prior to a complete engineering investigation, a mystery, and not a subject for speculation. The facts, however, that are obvious are so clear and substantial that one feels a large amount of assurance that no one who had anything whatever to do—as engineer or contractor—with the design or construction of the above-ground steel tank of the Gadd and Mason gasholder in which the disaster started, is in any way blameworthy. The holder has been working without a hitch for about three years; and there has been nothing whatever to raise any suspicion as to the steel tank containing any weakness. Whether or not there was an undetected structural weakness, it is quite plain, after such a length of satisfactory work in widely varying atmospheric conditions—with the tank containing about 7600 tons of water, and the holder having a capacity of 400,000 cubic feet—that some singular combination of local circumstances tended to produce the tank burst that let out the huge volume of water in a mighty, if short-lived, torrent that had such devastating effect upon the buildings standing in the course of its violent flow. What the combination of circumstances was, it has been referred to Mr. Samuel Glover and Mr. J. Ferguson Bell to attempt to penetrate, with the assistance of Mr. F. C. Humphrys, the Corporation Gas Engineer and Manager. The Local Government Board or the Board of Trade are not proposing to hold an inquiry; but the cause of the accident has, if possible, to be fathomed. And Messrs. Bell and Glover have a responsible duty in making careful investigation of foundations, subsoil, design, and construction, in order to endeavour to ascertain the conditions that led up to the disaster. There is no suggestion that the Gadd and Mason system, as a system, contributed in any way to the catastrophe. The steel tank stood on a concrete bed; and it simply ripped down and then opened out, parting at the base of the angle from the bottom plates—allowing, as previously said, the water to come out in one heavy wave in the direction of the open yard. At the time of the accident, the holder was standing inflated by an estimated content of some 320,000 cubic feet of gas. With the release of the gas, the holder came down, and settled with about half its diameter out of position, but remained standing upright, and very little distorted.

However, the cause of the rupture of the tank must remain free from speculation or theorizing until the engineering inquiry has been completed and duly reported upon. Naturally, being a gasholder, lay minds have associated the event with the explosion of the contents of the holder, without consideration of the question as to how an explosive mixture could have been formed within the holder, and how it could have become ignited there. Certain ill-informed electrical contemporaries have also ranked themselves with the lay press in this matter, and have written some of the most absurd and erroneous commonplaces in regard to the matter. The whole of the circumstances as narrated by those most intimately associated with the disaster, the whole of the evidence obtained by Mr. Humphrys, the engineer of the works, and that obtained by an examination on the spot by independent engineers, all point to the damage to the neighbouring buildings and houses having been due to the force of the sudden flood, to falling material, and to scorching by the huge but transient flames caused by the outside ignition of the gas that escaped first from the largest holder, and secondly from a neighbouring (and the second largest) one, which suffered severe damage from flood and battery.

The circumstances of the accident at present available, and the details of the damage, are presented in specially contributed articles in other columns. The disaster, unfortunately, involved one death by drowning; but otherwise there does not appear to have been anything more than superficial injuries. This is another evidence of the absence of explosion. Still further no damage was done to buildings or plant that were out of line of flood and temporary flame; and the carbonizing and purifying plant remains intact. Upon these aspects of the catastrophe we, having in view its character, congratulate both Mr. Humphrys and the Corporation. The accident and the consequences have precipitated Mr. Humphrys into a time of severe trial and strain. For a long space of years, he has devoted himself to the undertaking and its business, and has, with the aid and support of his Committee, brought the gas service to a high pitch of perfection, with low prices ruling among the consumers. He has received numerous expressions of sympathy, and in them we and (there is certainty) all our readers participate most sincerely. His brother (Mr. Norton H. Humphrys) visited him as quickly as possible after the occurrence. The prompt presence, too, on the scene of the disaster of his new neighbour, Mr. J. Wilkinson, the Chief Engineer of the Nottingham Corporation Gas Department, was much appreciated by Mr. Humphrys, as was also, both by him and the Corporation, the equally prompt offer of the Nottingham Gas Committee to couple up their mains, if necessary, with the Ilkeston distributing system, and so temporarily assist in supplying the area.

The Coal Cloud.

The matter of greatest present concern for gas undertakings is the menace of a coal strike and (if present conditions culminate in such a disaster to the country) the consequent complete cutting off of supplies, with a possible curtailment of supplies meantime. It is now fairly certain that the result of the ballot of the miners that has been taken is that the necessary two-thirds majority in favour of a strike on the minimum wage question has been realized, though the complete figures will not be obtainable before the conference of the miners' delegates is held at Birmingham on Thursday. There is no question about it that the men of South Wales, Durham, and Scotland are very much in fighting mood; and this fact, and the mandate to order a national coal strike that a two-thirds majority will give to the miners' leaders if they cannot secure the concession of the minimum wage for each individual, must not be forgotten in calculating the chances of war or peace, and when listening to the cheery words of the optimists.

Of course, it is not inevitable that a strike will take place; no one can speak positively as to this before the conference of the men's delegates next Thursday, nor before the sitting of the Conciliation Board the following Tuesday. The fact of the matter is that the position is at the moment such a

complicated one that it is impossible to make any sort of forecast. As things stand, here are the men showing (so far as can be gathered) the requisite majority for a strike; and the vote means that the extremists among the leaders have a larger following from the rank-and-file than the leaders of more moderate and stable views, and who are animated by a greater sense of justice and prudence. It is said that the moderates among the leaders are allowing the extremists to ride for a fall. But be that as it may, the latter feel that they have the majority of the men with them. Anyway, this is sufficient to show the division that exists among the miners' advisers. On the other hand, the coalowners say, and rightly, that a fixed individual wage, irrespective of the amount of work performed, is something that is impracticable and cannot be conceded. The men have been invited to show how such a proposal can be made practicable, but up to the present they have not responded. Meantime, the masters stand firm. It has been suggested that a line of compromise is possible, and has been indicated; but it is a very vague and shadowy line. With such uncertainty reigning, no large user of coal, such as a gas undertaking, can afford to neglect precautions.

The London Gas Companies announce the possession of large reserves; and gas undertakings throughout the country, with the repeated warnings that have been given by events, will have stocks in hand as large as they have ever had at this season of the year. But there are two or three factors that may have an influence on stocks before (if unfortunately this happens) hostilities actually break out, and work at the mines ceases. In the first place, there is a great pressure for coal; and all gas undertakings are not having deliveries so regularly as they could desire. Though there are good stocks in stores and yards, there are cases in which the schedules of deliveries under contracts are not observed so closely as would, under present circumstances, have been preferable. It cannot yet be said exactly when (if a strike is to take place) it will actually commence. The miners do not appear to be desirous of unduly hastening the closing-down of work. There may be method in what they are doing. Already, reports are to hand that the men at some collieries are slackening in their output for the very purpose of preventing the further accumulation of stocks, and of running-down stocks, before they actually leave work—their contention being that large reserves in the hands of important users are antagonistic to the interests of the men at such a time. There are also statements that negotiations are pending with the view of getting the transport workers to make common cause with the miners, or, at any rate, to decline to handle coal should a strike eventuate from the present position. Assuredly the clearest thing is the nebulosity hanging over the situation; and when hints of the likelihood of such a situation were first in the air, these must have immediately brought every gas management to a state of watchful attention and action, and caused preparation to meet the worst, should it fall upon the country.

Sulphate of Ammonia Market.

THE report by Messrs. Bradbury and Hirsch on the position of the sulphate of ammonia market during 1911 is at once gratifying and disappointing. On the one hand, we have the fact—a fact that has been disclosing itself in the accounts of the gas undertakings of the country—that the average price for the year, of £13 15s. 3d. per ton of sulphate of ammonia, is £1 12s. 1d. per ton better than it was in 1910, and that it is necessary to go back some 27 years to find so high an average—the figure in 1884 having been £14 9s. 3d. This is a highly agreeable fact. But it would be still more gratifying, if it were possible, to find associated with the substantial improvement reasons that presented rather more solidity, and therefore gave greater hope of permanence than can be extracted from the position as it is submitted to us, though the position cannot be said to be cheerless. There was an increase in the consumption during the year; but the increase was not at the same rate as in 1910. It was mainly in export business, and not for fertilizing purposes at home, though the decline in the latter direction has been about counterbalanced by large requirements for chemical purposes. It is regrettable that our home agriculturists and horticulturists are so slow-moving in this matter; but it only shows the educational difficulties that the Sulphate of Ammonia Committee have to encounter, and the strength of the need for, on their part, persistent work, as well as the extended work at home to which they have put their hands, while at the same time assisting in every possible way the operations for the development of foreign markets.

Putting the consumption of the United Kingdom for all purposes during the year (85,500 tons) in juxtaposition with the exports (292,000 tons), the importance of the trade abroad is emphasized; and it is borne home how propaganda activities must be ruled by the circumstances of the case and times. Besides, Messrs. Bradbury and Hirsch take considerable pains to show the shifting foundation of the export trade and the variable influences brought to bear upon it. There is, however, an aspect of this shifting demand from abroad that appeals to us as being rather useful in assisting to maintain prices; and it is that it appears when, in one distant quarter, the demand is somewhat sluggish, in another part of the world the demand becomes buoyant. Diverse demand factors in a business of this kind are good in relation to price maintenance. When Japan is not making strong demand, then the United States are; and when the United States are not extensive buyers, Japan comes to the fore with increasing wants. That is an actual condition in the immediate past and present years that serves as illustration. In 1910, there was an enormous demand from the United States; but the requirement of Japan fell off. Last year, the United States demand receded, but Japan beat all its records. Purchasing is still on a good scale there, while the United States do not hold out any very great immediate change in improving the scale of their purchase. Business continues to decline with France, Germany, and Belgium, owing to their ability to meet their own necessities through increased production. These are the countries, too, with whom we have to reckon in the competition for export business. They are also the countries that are equally interested with us in enlarging the demand everywhere by propaganda work. For these various reasons, it is highly essential that still greater attention should be paid to the more distant export business. On the year, exports are better by 8000 tons than in 1910.

The position of production at home during the year is interesting. Of the world's estimated production of nearly 1,150,000 tons, we produced last year 378,500 tons—*i.e.*, an increase of 11,000 tons. Germany now exceeds us as producers; but Germany is a very considerable consumer. However, the estimates of Messrs. Bradbury and Hirsch indicate that gas-works added about 1500 tons to their production, making it 169,500 tons. Iron-works made no departure from the 20,000 tons of the previous year. Shale works, with 60,000 tons, increased by 1000 tons; while coke and carbonizing works and producer gas plants yielded some 129,000 tons, or an increase of 9000 tons. This increase is exceedingly interesting, as it shows a recession in the rate of increase from the coke-ovens. The increase is, in fact (as will be observed by referring to the tabulated figures in the abstract we publish to-day of the report), the lowest on record during the past six years. But there is another point to be noted; and it is that the coke-oven and cognate plants are now only 40,000 tons behind the annual production of the gas-works of the United Kingdom. We are not sorry to see this slackening off in the rate of increase, until there is more expansion in the demand for sulphate.

What are the prospects? The year commences with prices at a good level; and the outlook is not discouraging. Germany's home requirements appear to be promising; so that it may be expected that that country will not offer any serious menace in the coming season in the foreign markets. The United States do not bid us hope for any enhanced business with them just at present. Japan, on the other hand, is a promising customer. In other directions, apart from the near Continental countries, we stand a good chance. On the other hand, nitrate of soda is relatively cheap. But there is nothing on the horizon that suggests anything adverse to the current year bearing, in respect of sulphate of ammonia, characteristics equally as good as those of the past one. This is the impression left on our minds after considering the case as put before us by those whose business it is to judge of the future of the market by the visible signs of the present.

Rival Industries Controversy.

We believe that the controversy that has been proceeding in our columns with the "Engineering Correspondent" of the "Daily Telegraph" has now drawn to a close; but, in view of the result of the controversy (of which we were from the first well assured, so long as our opponent, who has acted throughout in a friendly

spirit, would discuss the real points at issue), there is no intention on our part to put a bar to anything further that he may desire to say. The matter was taken up entirely in the interests of the gas industry. It was time that someone made a serious onslaught on some of the writings in the public press that, through absolute want of knowledge and incogitance, give a bad character to gas and its performances. The opportunity to deal with a writer holding a responsible position on a paper of large circulation and influence was one not to be missed, providing that he could be induced to accept a challenge. The issue has been seen; and we hope it will have a salutary influence in other quarters. There is another step yet to be taken elsewhere to put a stop to the slanderous statements made in reference to gas. We know privately that legal opinion has already been sought on the subject; and it only remains for proof to be secured of damage to business in the particular matter in question—proof of, say, a customer being influenced to turn from gas to electricity through libellous statement—for the slanderers to be brought to book. This, however, merely by the way. The controversy that has been proceeding has shown the injurious extent to which dogmatic assertion is sometimes made without foundation; and the gas industry is about tired of dogmatic assertion of the kind. It means to have just treatment. That is all it desires. In our final criticism elsewhere in this issue of matters raised in the controversy, among other points that we hope will be found interesting, is a reliable computation that, in the Metropolitan area, there are in use to-day on the system of parade or "scale" lighting, approximately 9000 of the Keith high-pressure lamps.

Hampstead's Errors.

The Hampstead Borough Council have again had the local "scandal" under consideration; but this time a majority of the members did not shut the doors of the Council Chamber in the faces of the ratepayers. They have had such a drastic lesson over their former attempt at secrecy that they saw fit not to again raise a storm of indignation as they did on the last occasion. But the proceedings at the meeting were very tame and very thin; and there was some endeavour to do a little self-whitewashing. Mr. Cottam is to go in July; and three months more are to elapse before the Council consider the question of a superannuation allowance to him. We suppose it is hoped that by that time distance will have dimmed somewhat the present position of affairs; or, on the other hand, that by then, a Local Government Board inquiry may have been held, if the ratepayers who are moving in the matter are successful in getting the President of the Board to take it up. Probably a report from such an inquiry would give the Council the excuse for taking a different course in regard to Mr. Cottam. Meanwhile, correspondence in the local Press continues. There are more complaints about the lighting of the streets by electric lamps, and more testimony to the fact that the new lights are not so brilliant as the old ones. One ratepayer speaks of the "hopeless inefficiency of the electric lights;" but, it seems, there is a Mr. Hulls, who is a member of the Council, and who would have the ratepayers believe that inverted gas-lamps are also "hopelessly inefficient." According to one report, it is declared that he said, at the recent Council meeting that, owing to the difficulty of getting the sufficiently even pressure necessary for the inverted form of gas-burner, the light would be unsatisfactory. We hope Mr. Hulls has been misreported, and that he was not guilty of such a grotesque statement. What is the use of talking in this way when the contradiction is presented so substantially in such large and important areas of London?

Further Concessions to Birmingham Consumers.

Congratulations are due both to the consumers and to those who have been responsible for the operations of the Birmingham Corporation Gas Department, on the excellent financial position which is disclosed. Except in times of abnormally dear coal supplies, reductions in the price of gas at frequent intervals are not an unusual feature in connection either with company or municipal concerns. But that the same undertaking should find itself in a position to announce two reductions within one financial year affords proof of striking prosperity—even in an industry where prosperity is the rule, and not the exception. After the reading of the meters last June, the Birmingham Corporation Gas Committee made reductions which brought the charge to small ordinary consumers for lighting, heating, and domestic purposes down to 2s. 2d. per 1000 cubic feet and, the minimum prices for large consumptions to 1s. 3d., subject to 5 per cent. discount for prompt payment; while concessions were also made to the prepayment meter users. Now, only six months later—that is, from the Christmas reading of meters—the Committee are able to announce further reductions. These will make the charge to small ordinary consumers 1s. 11d. per 1000 cubic feet, with a minimum of 1s. 2d. for large ones; and the rates for gas used for power and manufacturing purposes, 1s. 4d. per 1000 cubic feet where the consumption is less than 1,000,000 feet, down to a minimum of 1s. for very large users. These prices are, again, to be subject to 5 per cent. discount for prompt payment. The slot-meter consumers, too, have not been forgotten; for they will receive a greater quantity of gas for a penny than was the case before. This second series of reductions, Alderman Sir Hallewell Rogers informed the members of the City Council, has been made in consequence of the fact that the estimates for the year ending in March showed a larger surplus than had been anticipated. The contribution to the rates is not in any way to suffer, for no doubt is entertained that the Committee will be able to contribute at least the same sum as last year—namely, £75,000, which it was then stated was the largest contribution that had been made to the improvement rate of the city. Therefore the ratepayers will have no cause to say that the consumers are benefiting at their expense—though we do not admit that there would be any just cause of complaint even if they did. The splendid position of the undertaking is owing to a gratifying increase in the consumption, to high prices for residuals, and to good work done by officials, to whom Sir Hallewell Rogers gives the credit that is their due.

Present-Day Gas-Works Accounts.

The paper that Mr. C. H. Foden, of the Manchester Corporation Gas Department, read last Saturday before the Manchester and District Junior Gas Association on "Gas Accounts" is one that is welcome both in respect of its subject-matter, and its timeliness. It is somewhat strange that the topic has not been more generally dealt with at meetings of the technical organizations, as, with the large extension of the business of a gas undertaking, and the immense development of new branches of business during recent years, quite a new order of things has been introduced. This new order of things applies not only to the accounts appertaining to the gas and residuals sales departments, but to the works themselves. With this expansion of work in all directions, the systems of accounts have naturally undergone development in all undertakings; but there has been very little comparing of notes as to the details of the systems adopted. Yet by such comparison various profitable "wrinkles" might well be discovered. No man, with accounts having the ramifications that those of a large or moderate sized gas undertaking possess, would be prepared to allege that, in every detail, he has arrived at the acme of perfection, or that there was no point on which he could profit by a knowledge of the experiences or practices of others.

Facility, Time Economy, and Protection.

The bases of all methods of keeping accounts should be facility of working, economy of time, with full protection for both the gas undertaking and those with whom business is done. The same applies to the manufacturing and working statements. They should be so organized that protection is given as between the responsible management and the subordinates. In short, there should, in the system of accounts, be protection for all; and this, it is well known, is not universally the case. All this means a very complete construction of the system of gas-works accountancy methods. System spells economy. The system that has been developed at Manchester as the undertaking and business have enlarged, appears to be exceedingly complete, and, taken department by department of the work, very simple. But the Manchester gas undertaking is not so great that, in submitting their system to inspection, the chief officials are unwilling to listen to criticism, or to consider suggestions for improvement that emanate from practical experience. There are so many points in Mr. Foden's interesting paper that we will not call attention here to any of them, except to say that investigation of manufacturing questions leads us to fully endorse the point he makes in remarking: "While the cost per ton of coal carbonized is all right for certain purposes, the correct cost for general purposes is per 1000 cubic feet made—this being the finished product; whereas a ton of coal can vary considerably in its properties."

Nickel or Bronze Coinage.

Time and again, someone raises the question of the substitution of our bronze coinage by nickel coins as on the Continent. If the suggestion had been made, and had been adopted, before the British gas industry had worked up such a mammoth business in gas supply with prepayment mechanism operated by the existing penny piece, it would have been the means of saving much labour in the matter of collection, through the lessened weight. But the position is now altogether different. The gas-meters in use which require a coin of the size and weight of a penny for their operation are to be counted now not by the thousand, but by the million—the total in use being something like 3 millions—and the suggested conversion would, if effect were given to it, mean such vast expenditure to the gas industry and such vast inconvenience to the poor, that it would raise very general indignation. The gas industry would have a great deal to say on any serious proposal that was put forward in this direction; and very good reasons why they would do so are shown in an article on the subject by Mr. W. J. A. Butterfield, M.A., Assoc.M.Inst.C.E., that appears in other columns to-day. At the moment, however, the suggested change is not in serious form before the country.

Recent Incidents.

"A London Club Member," who has been representing the "Liverpool Daily Post" in India during the recent royal visit, in one of his articles, says that few have seen such a gorgeously dressed crowd so near a panic as on the night of the Investiture at the Durbar. "Whistles and bells which denote fire began to be sounded on all sides of the tent. Shouts were heard outside, bugle calls were blown, some reflections of fire were to be seen on the top of the tent; and, to crown all, the electric light flickered abnormally. The King went on impassively decorating; but there was almost a panic. Ladies shrieked, two or three fainted, others rose and prepared to rush. . . . I am told that a bicycle lamp was left lighted in a tent, and this ignited; but it is far more likely to have been an electric wire fusing." Another incident nearer home. During the dense fog last Wednesday, a wire fused at the drapery establishment of Messrs. James Spence and Co., of St. Paul's Churchyard, E.C. All the lights went out; and this with the speedy arrival of the fire brigade caused considerable alarm among the ladies who were shopping at the time. Prompt measures and the use of sand soon restored normal conditions. Meantime, however, St. Paul's Churchyard and the neighbourhood were rendered impassable by excited crowds. On Friday, a foot passenger in Queen Victoria Street (Mr. E. H. Lismore, of Redhill) was struck on the head by an electric arc lamp which is said to have fallen from a distance of nearly 40 feet from outside the offices of the General Electric Company. The lamp weighed about 28 lbs.; and there is no doubt his life was saved by his hat. Nevertheless at St. Bartholomew's Hospital, it was found that he was severely cut across the head, and was suffering from partial concussion.

Urban District Council Loans.

In many respects—though, of course, the transactions involved are far less extensive—the accounts of the Urban District Councils as set forth in the Annual Local Taxation Returns are similar to those of the Borough Councils which were recently noticed; but there are no columns showing, in regard to the trading undertakings, the sums that have been either handed over in relief of the rates or that it has been necessary to allocate from other accounts to make good deficiencies in revenue. In the present returns, which are for the year 1909-10, the number of urban district councils whose accounts are dealt with is 818, compared with 327 borough councils; but while the rateable value of the former is £34,527,455, that of the latter is more than twice as much. The total amount of loans outstanding in the case of the borough councils is about £252,000,000, and in that of urban district councils £37,000,000. Taking now the accounts of the urban district councils, it is seen that, of the total amount owing by these bodies, £3,449,329 is on account of gas-works, £5,621,352 for water-works, £2,511,398 for electric lighting, and about £2,250,000 for tramways and light railways. In addition, there are some small sums for other revenue earning concerns; so that altogether a very large proportion of the total loans is for what are termed "reproductive" undertakings. Of the rest, nearly £9,000,000 is on account of sewerage and sewage disposal works, £3,250,000 for street improvements, and £4,000,000 for education. The outstanding loans in the case of these councils only aggregate about £500,000 more than was the case twelve months previously. Other details of this return will appear in an early issue of the "JOURNAL."

PROFESSOR BONE AND THE LIVESEY CHAIR.

GREAT regret will be felt in all quarters at the news that Dr. Bone is about to resign the Livesey Chair at the Leeds University, in consequence of his having accepted an invitation from the Executive Committee of the Imperial College of Science and Technology, London, to go there as Professor of Fuel and Refractory Materials, with the general supervision of the new Department of Chemical Technology which it is proposed to shortly inaugurate. His appointment (which was finally confirmed on Friday last) is the first outward sign of a movement which has been shaping for some years to establish in London a Department of Chemical Technology worthy of its Metropolitan and Imperial position, in which provision will be made for higher specialized teaching and research. Such a scheme cannot, of course, be developed in a day—it will require time; but a start is to be made at the beginning of the next academic session. The subjects which it is proposed to develop in the first instance are: (i.) Fuel and Refractory Materials; (ii) Chemical Engineering; (iii.) Electro. Chemistry. Each of them will be in charge of a Professor, who is a "specialist" in his subject, while Dr. Bone is to exercise general supervision as regards organization, &c., in addition to his special responsibilities as Professor of Fuel and Refractory Materials.

OBITUARY.

JOHN SMITH GIBB.

THE death occurred on Friday last, at his residence in Cobden Terrace, Edinburgh, of Mr. John Smith Gibb, late Treasurer to the Gas Commissioners of the Edinburgh and Leith Corporations. Mr. Gibb, who was in his 81st year, had been in good health till about eight days before his death, when he began to feel unwell. The illness, in view of his age, was not considered serious. Indeed, only as recently as the night of the 11th inst., he attended a meeting of the Edinburgh Bibliographical Society (of which, as well as of the Society of Antiquaries of Scotland, he was a member) and took part in the discussion of a paper. Subsequently, however, his condition became worse, and he gradually lost strength.

Mr. Gibb was a native of Glenesk, and was in early life a schoolmaster, and became Rector of Dalkeith Academy, from which he went to take up the treasurership of the Gas Company in 1874. When the Gas Commissioners took over the undertaking in 1888, Mr. Gibb was appointed Treasurer; and he filled the position until August, 1910, when he retired. On that occasion, the Commissioners, on the motion of Lord Provost Brown, placed on record a minute of their appreciation of the long and faithful service of Mr. Gibb, and presented him with an illuminated and framed copy of the minute. In parting with Mr. Gibb, the Commissioners, through the Lord Provost, conveyed an expression of their sincere regard. Mr. Gibb, in reply, said he had tried to mould his public and private life in accordance with the old divine injunction: "Whatsoever ye would that men should do to you, do ye even so to them." He could honestly say that, during the thirty-six years he had been with the Gas Company and the Commissioners, he had never had any serious differences with either his superiors or his colleagues.

Mr. Gibb leaves a widow, six sons (one of whom, Mr. W. Doig Gibb, it will be remembered, is the Chief Engineer of the South Metropolitan Gas Company), and two daughters. It is worthy of record, in connection with Mr. Doig Gibb's removal from Newcastle to London, that his late father was always proud of his private friendship with Sir George Livesey. It began during Mr. Gibb's presidency of the Institution of Gas Engineers in 1908; but it developed rapidly, and the friendship and mutual regard continued till Sir George's lamented death in October of that year. It is rather remarkable that Mr. John Gibb's death is the first break in a family of eight; and if he had been spared for another year and eight months, he and Mrs. Gibb would have celebrated their golden wedding. Referring to his personal qualities, a local paper says he was "the very essence of straightforward manliness and integrity, always helping and cheering those around him, and entirely unselfish." His memory will live among his many friends.

The funeral has been fixed for to-day, in Morningside Cemetary.

The death is announced of Mr. THOMAS SIMPSON, who passed away last Wednesday, at his residence in Daventry, after an

illness extending over several years. Deceased, who was 75 years of age and a native of Edinburgh, spent ten years at the Northampton Gas-Works. After this, in 1867, he was appointed to the position of Engineer and Secretary of the Daventry Gas-Works—a post which he retained until about ten years ago, when he retired owing to ill-health. When Mr. Simpson first went to Daventry, the gas-works were scarcely a profitable concern; but by sheer hard work and tactful administration, he revolutionized affairs there. During his long tenure of office, the whole of the works were practically reconstructed, and modern improvements instituted. He was also for some time connected with the gas-works at Long Buckby and Weedon, and supervised the private gas plant at Fawsley. In addition, he was for many years Secretary to the Daventry Water Company. Deceased was brother to the late Mr. Peter Simpson, who was at one time Manager of the Rugby Gas-Works.

PERSONAL.

At last Tuesday's election of members, &c., of the Institution of Civil Engineers, Mr. WILLIAM HAROLD ARTHUR CHESTER, of Nottingham (son of the late Mr. W. R. Chester), was elected an associate member.

Mr. J. WILKINSON, who has now entered upon the duties of his position as Gas Engineer at Nottingham, was last Saturday presented with a silver fruit dish by the chief officers of the Halifax Corporation on his relinquishing the management of the gas-works there to take up his new appointment. The Mayor (Mr. G. T. Ramsden) made the presentation.

Mr. JOHN JONES, who has retired from the service of Messrs. Harris and Pearson, of Stourbridge, after having served the firm for nearly half-a-century, has been presented by his colleagues with an easy-chair and an illuminated address. Mr. A. H. Pearson, one of the principals, made the presentation, and several of the workpeople, whose terms of service ranged from twenty to sixty years, spoke of the good feeling existing among the employees, and between them and their principals.

Consequent upon the changes in connection with the gas supply of Calcutta to which references have been made from to time in the "JOURNAL," Mr. HENRY V. EASTWELL was on the 1st of May last appointed, by the General Committee of the Corporation, Superintendent of Public Lighting for a period of nine months, at a salary of Rs. 625 per month. At a meeting held on the 23rd ult., the Committee had before them an application by Mr. Eastwell for an increase of salary, He pointed out that in organizing the new Lighting Department of the Corporation, and in training an entirely new staff, besides preparing all estimates, &c., he had had to work practically single-handed, and had generally to take the full working responsibility of the whole scheme without the help of a consulting expert as was originally intended. In forwarding the application, the Chairman recommended that it should be granted. In doing so, he said: "I have been in close contact with the work of Mr. Eastwell during the last eight months. I recognize that he has put his whole heart into the business of the new Lighting Department and has shown very great power of organization. The work which he has already done has been both onerous and responsible; in fact, the responsibilities and the volume of work have far exceeded the expectation of the General Committee when they passed their resolution of April 21, 1911," under which the appointment was made. The Committee approved of the recommendation; and Mr. Eastwell's salary was raised to Rs. 750 per month (or £600 per annum) as from the 1st inst.

Last Tuesday, there was opened at the Westminster Technical Institute, Vincent Square, a new session of the Cookery Technical School for boys, which has been started there by the London County Council. It can accommodate 45 pupils; 15 new ones being admitted each year. The term fees are £3 3s., or £9 9s. per annum; and these entitle all pupils to the free use of the cooking appliances, paper, text-books, note-books, and materials for cooking. The school is fully equipped with the latest culinary appliances, including a central cooking-range, gas cookers, grillers, and steamers. Upon the Consultative Committee is Mr. Thos. Goulden, Chief Engineer of the Gaslight and Coke Company.

Referring to the lectures by Professor Lewes on the "Carbonization of Coal" and the subsequent correspondence in "The Times" on the subject of the domestic use of coke, the "Iron and Coal Trades Review" last Friday said: "Professor Lewes divides coke into two main classes: (1) Metallurgical and furnace coke, in which everything has been done to obtain the largest yield of coke, having definite characteristics, and in which the bye-products, gas and tar, are either disregarded or considered of secondary importance; and (2) gas coke, made by processes designed to give the largest yield of gas, in which as much of the carbon as possible shall be in gaseous combination—the coke residue and tar being looked upon as of secondary importance. Evidently what is now wanted is a third class, comprising coke specially made for domestic fuel by leaving in it 6 to 8 per cent. of volatile matter to facilitate ignition and give a flame. The question of producing such a coke, with low ash and sulphur content, appears to be well worthy of consideration, not only by the gas companies to whom the appeal was made, but to those also who are engaged in the production of coke at the mine."

ELECTRICITY SUPPLY MEMORANDA.

Converting Street Lamps to Metallic Filaments—Drawbacks and Complication—Mephitic Atmosphere—Some Home-Made Electric Heating Appliances—Expert-Made Ones—Death at 230 Volts—Blurred Vision.

IT is obvious, when the cost of installing electric street lamps is considered, and the fact that electric current is supplied to them at the peak of the lighting load at a price much below that charged to private consumers for lighting, that many municipal electricity suppliers do the work of street lighting for the sake of the advertisement, and in order to gild their own prestige in the eyes of the ratepayers. Whether they succeed in the latter partly depends upon the degree of their success in keeping the facts as to the expenditure from the sight of the ratepayers. We know, from the recent disclosures at Hampstead, that the cost of converting the lamps there from gas to electricity (using electric lamps that in pairs were to give 56-candle power per column) worked out to an average of £10 15s. 6d. per post, with the result that the ratepayers received a shock on learning that the estimates of the cost of conversion had been exceeded by £10,326. They also suspect that in time they will learn that the annual cost per lamp (£2 0s. 2d.) will fall considerably short of what it should be, while they are already satisfied that they are not getting the illumination they bargained for. These illustrative remarks occur to us on reading an article on "Street Lighting," by Mr. H. F. J. Thompson, the Chief Assistant Engineer of the Battersea Electricity Department. He starts off by suggesting that gas companies, when they get the opportunity to light an important thoroughfare, almost invariably consider it a question of advertisement. If they did this, and did not look to making a profit on the transaction, there would, we venture to think, be even less electric lighting in the streets than there is at the present day. It is quite true they realize the advertisement value of street lighting; but it is equally true that there is not enough in this advertisement for gas companies to lavishly throw away money upon it year after year—money which might more profitably be spent in tightening their position among the larger *clientèle* represented by the private consumers. At the same time, we wish that more gas companies would regard as a good investment a little more expenditure on voluntarily improving the types of a number of street lamps in their areas by way of advertisement; and, of course, they have to realize that, where their competitors for street lighting are prepared to treat the public lighting in an uncommercial spirit in order to secure a contract, they, on their part, must not expect the profit on the public lighting by gas to be on the same scale as in times past.

However, Mr. Thompson's main theme is the conversion of public lamps that have been fitted with the old open-type white arc lamp; and he discusses the question whether conversion shall be by flame arc or metallic filament lamps. If it is desired to light the streets sufficiently for all practical purposes, the metallic filament lamp, in his opinion, will meet all requirements; and this is the electrical tendency of to-day. Battersea has converted the whole of its 432 open-type arc lamps to metallic filaments; and so Mr. Thompson speaks from experience. The technical question comes in as to how conversion shall be effected; and whichever system is adopted, there are difficulties that are likely to reveal themselves at any moment. Supposing a district supplied with direct current from a three-wire system, with the arc lamps arranged in series of ten connected across the outer conductors of the system. The easiest method of conversion is to arrange for one high-candle power lamp, or else a group of low-candle power low voltage lamps on each post, and to run these posts in series in the same way as the arc lamps. There are, however, "many drawbacks" when compared with a group of high voltage lamps on each post arranged in parallel between the outers and the middle wire of the system. With the series method, Mr. Thompson points out, it is found that it is a difficult matter to maintain an equal pressure across the supply terminals at all the posts connected in series, due to the varying resistances of the lamps; and also some automatic device has to be provided to cut-in a substitutional resistance or spare lamp in case of lamp failures. When a group of small lamps on each post is decided upon, in preference to one large lamp, in order to prevent a post being in darkness, the automatic device usually only takes care of one lamp; and then in the event of a further failure, an increased pressure is put on the remaining lamps on that post—"often" resulting in their destruction, and the *extinction* of the circuit. He therefore advises the connection of the lamps in simple parallel. But here again this manifestly necessitates the provision of a service to each post from the neutral conductor. Compensation, however, for this is found in being able to fuse each post separately, and in this way have only one post affected, instead of the whole series of lamps, in the event of a fault occurring above ground.

Mr. Thompson describes pretty fully the methods of conversion adopted in Battersea. The lanterns there each contain four lamps, two of which, in order to save current, are automatically switched out at midnight by means of a special switch placed in each lantern, which enables the candle power of each post to be reduced by half at midnight. In districts that are not extensive, the partial switching-off is effected by hand; but where extensive, it pays to adopt automatic control. These latter switches are

usually operated by clockwork, which requires rewinding, by the lamp cleaners; but as it is not advisable to allow these men to do the setting for the switching "on" and "off," an automatic arrangement for the purpose, consisting of toothed wheels positively driving the operating mechanism, has been adopted; and this only claims the movement of a small lever once every six months. From all of which, it is seen that, on the testimony of one with experience, the metallic filament lamps have their drawbacks for street lighting, and the equipment of each lamp-post is a somewhat complicated matter. With an incandescent gas-burner in a street-lamp, an occasional damaged gas mantle is all that has to be contended with; in an electric street-lamp failure risks reside in every fitting, as well as in the lamp itself.

The Patent Office has made several attempts at improving the lighting of the library, to which inventors, searchers, and others occasionally wend their way; but there has not been success in pleasing all those who make use of the valuable stores of records there. The "Engineering Correspondent" of the "Daily Telegraph" is not by any means satisfied with what has been done. The place is electrically lighted; and where metallic filament lamps are employed, the further expense should be incurred of providing protection for the eyes of readers from the injurious effects—acknowledged by oculists, physiologists, and electricians alike—of the lamps. "Engineering Correspondent" complains that, while an improvement has been made at the central tables by the installation of holophane shades, yet the glare at the side tables is most unpleasant. This is not as things should be. It is a public institution; and as at public institutions, as a rule, expense appears to be no object—in this case, fortunately, it happens to be a productive institution with a revenue of its own—it is astonishing the improvement has not been carried to the side tables. But there is something else over which "Engineering Correspondent" finds some cause for complaint. Electrically lighted though it is, he finds the room depressing, and badly ventilated; and, in his judgment, if anyone can work long in the atmosphere of the place, he must be used to doing his mental work under conditions which show he can stand almost anything. These mephitic conditions are not peculiar to this electrically lighted Patent Office Library. We remember the complaint of "Meteor" over the insanitary stagnant atmosphere of the new lecture theatre of the Institution of Electrical Engineers, of the Sheffield City Councillors over that of their meeting chamber, of people who use the Law Courts——but there is no need to multiply examples; knowledge is growing. People, however, do not pay sufficient heed to the instruction of the Electricity Publicity Committee, that electrically lighted places should be fitted with an electric fan for the purpose of keeping the air in a sanitary condition. If they did, then the question comes in, "What size fan?" Manifestly, if "Meteor" was justified in his complaint over the lecture theatre of the electrical experts, the fan that was originally fixed there was not sufficiently competent to perform the work required of it. It is an interesting world, and our electrical friends are certainly not the least interesting of the people in it.

The "Electrical Review" is not consistent. It prays earnestly to be defended from the machinations of those who, in the mistaken notion of commercially benefiting the electrical industry, would lower the standards of electrical fitting work that have been set in the humane attempt to ensure safety, though those standards have been found seriously wanting. Yet it has admitted to its columns an article that suggests the introduction into the dwelling-house of home-made electric heaters and hot cupboards. One of the propositions is a bedwarmer. In "The Times" recently, we were shown that electric warmers are not suitable bed companions, in view of the fact that they sometimes exceed their main function, and cause more heat and damage than is required or is convenient. The author of this article is one "Whistlefield." There is something about the combination name that suggests a fine freedom and expansiveness, and his suggestions partake of the same character. He says that the heating properties (plural) of carbon lamps can be usefully employed. Of course, at one time carbon lamps had not, according to electrical dictum, any heating property; but we are now told that at least one firm of manufacturers uses a carbon lamp as the heating element in a guinea bedwarmer. There must be a long profit on this bedwarmer; and the ingenious Whistlefield thinks it might be saved by procuring a tin from a grocer's, a five-candle power carbon lamp, a cord gripholder and a length of flexible, ending in an adaptor or plug. Fitted together, these will make a bedwarmer. Well Mr. Whistlefield can go to bed with his bedwarmer if he likes; but there is no occasion for other people to do so. Then he suggests a footstool made in the same manner, with the bottom and sides lagged with sheet asbestos to prevent radiation. If the tins have highly polished surfaces, the makers of a certain type of electric cooking-oven—makers with good broad views the same as Mr. Whistlefield—will tell him that no lagging is required, but that the reflecting surfaces will retain the heat in the footstool. An eight-candle lamp is suggested in this instance; but a condition to the use of the footstool is that only thin slippers should be worn. He also suggests the making of hot cupboards in much the same way—again having recourse to a suitable box from the grocer's. If home-made electrical appliances of this kind are recommended in technical electrical papers, people will begin to doubt their sincerity when preaching on the subject of the maintenance of a high standard of electrical work in the household.

Look on Whistlefield's performance, and then on the letter that a consumers' engineer of a prominent electricity undertaking has addressed to the "Electrician." He makes a grave appeal to the expert manufacturers of electric heating appliances—especially of laundry irons—to adapt the goods they produce to the requirements of the users. He warns them that they must make good the defects and shortcomings in design at the earliest possible moment; for by continuing to supply goods known to be defective, no real advance can be made. Considering the length of time that electric domestic heating appliances have been making a bid for public patronage, it is time that their defects had been eradicated—if this be possible. There is the rub. The defects are known well enough; but their remedy is not a matter of easy negotiation. It appears that even to-day satisfactory electric irons are not available; for this particular mentor says that, if they were, there is good business to be done. He ought to know; for he has equipped "several" laundries; and in no case has the apparatus proved itself efficient. In one instance, the ironing staff, numbering about eighty, rushed out of the building, owing to an explosion caused by a short-circuit, due to an arc across the terminals of an iron. Laundry girls are not going to be trifled with in this way; and these particular ones declined to be parties to a repetition of the trial. He also finds there are troubles from shocks, irons are too slow in heating, or too cumbersome for quick work; and there are a "number" of other defects. This is a bad lookout for electric irons; and it shows what an immense amount of trouble there is to cure before perfection is attained. But the heating difficulty appears to be an insuperable one, especially for heavy starched work. For this, irons should be loaded up to 750 watts as a minimum, as below this the temperature is only sufficient to turn the starch into "glue," and make the garments adhere to the iron. Structural troubles are detailed by the critic; and then the unprotected flexible is attacked as a "primitive method" that is most unsuitable for commercial irons. The only alternative is the armour-clad metallic tube, about ¾-inch in diameter, which is described as a poor imitation of the gas-iron. That is not all. Owing to its weight, the operators decline to use the iron, which in actual practice "is as adaptable as though the cable were laid on the solid system." That is a bit sarcastic. We need not proceed, though the whole chain of difficulties is not here referred to. The present electrical critic of electric heating appliances does not suggest how the troubles are to be overcome.

There are some people who ridicule the idea that a voltage as low as 230 can give a shock sufficient to cause death. The Chief Electrical Inspector of Factories has not infrequently recorded deaths at voltages at this figure or thereabouts. Recently, Ernest G. Whitaker, a theatrical electrician, met with his death at a young ladies' school at Rochester, where he was superintending the limelight effects for an operetta. It appears that the insulation of the top arm of the electric arc lamp that was being used was defective; and, in the course of his work, deceased received a shock, and died. The voltage was 230. The medical testimony at the inquest was that there was no evidence of a weak heart; and the jury returned a verdict of death from heart failure due to electric shock.

We hardly know what to make of a sort of New Year's editorial address in the "Electrical Review." Our old friend was quite jovial and witty. The season probably had something to do with it. It wished the electrical industry (overlooking the claims of the gas industry) a happy and prosperous new year. Then there seems to follow a curious mixture. The "Review" confesses that it vainly tries to pierce the future; and so it turns from the mysteries of the year to come to the memories of the one that has just gone. But there again—this was apparently written very early in the New Year—the "Review" is a bit doubtful of itself. "We are," it says, "still too near to the old year to judge it fairly. The smoke of battle yet obscures the scene, and perhaps our vision is a little blurred." Well, well! it is perhaps excusable at such a season. But "the smoke of battle yet obscuring the scene," and "the vision being a little blurred" perhaps accounts for some of the statements that follow. We will only quote one philosophic remark. Here it is: "Electricity, of course, always has its best chances in a new district, where gas-pipes, chain armour, bows and arrows, and other obsolete appliances do not require to be scrapped." The singular article may be left at this one quotation—putting this and some other views down to the "smoke of battle" that "obscures the view," and to the fact that the editorial "vision" is admittedly "a little blurred."

Estimation of Free Sulphur.—At the meeting of the London Section of the Society of Chemical Industry on Monday last week, a paper describing a rapid volumetric method for the estimation of free sulphur was submitted by Messrs. C. Davis and J. L. Foucar. According to an abstract of the paper received from the Secretary of the Society, the method was devised by Mr. Davis particularly with the view of the rapid estimation of free sulphur in spent oxide, more especially that containing small quantities of organic matter soluble in the usual organic solvents. In the estimation of sulphur in the latter material, too high results are given by the extraction test, and an oxidation test is somewhat tedious. The method proposed is to treat the finely powdered and dried material with a solution of sodium cyanide in absolute alcohol; the resulting sulphocyanide being titrated in the usual way. It is stated that the results obtained are quite sufficiently accurate for commercial purposes.

THE DAILY PRESS AND RIVAL INDUSTRIES.

The Editorial Summing Up of the Controversy with "Engineering Correspondent" of the "Daily Telegraph."

WITH all respect for the admissions that the "Engineering Correspondent" of the "Daily Telegraph" has made in our columns and in those of our morning contemporary since last we criticized his first and very deficient article in our pages—deficient as a defence or justification of the points in his "Golden Lights" article of which we complained—we have to examine the position as it is now and as it was then, in order to show that our original criticisms have been fully vindicated. This perhaps is hardly necessary in view of the retractation made a week ago in the columns of the "Daily Telegraph;" but we feel the controversy in our own pages, through the letters of "Engineering Correspondent," requires rounding-off by a summing-up, and treatment of some of the further points raised by him. We take it that this will end the discussion—at any rate for the present, unless "Engineering Correspondent" desires to pursue any particular points. The final paragraphs of his letter last week (with the sentiments of which we agree) appear to suggest that he has come to the end of his tether in the matter, and that, within the limits of the matters raised in the controversy, he now leaves the field to us. We are, of course, not bound by "Engineering Correspondent's" desire that we should limit ourselves to figures, and eschew opinions. His defence, if so it can with any propriety be called, has been packed with opinions, speculation, and mistaken notions; and they are open to serious criticism.

MISLED!

In the first place, we may claim that his articles and letters warrant us in saying that the statements in the "Golden Lights" article, published in the "Daily Telegraph" on Oct. 7 last, so far as they were derogatory to the interests of the gas industry, had no foundation either in the personal knowledge of "Engineering Correspondent," or in fact. In a recent editorial in the "Daily Telegraph," dealing with a matter of current political importance, the writer spoke of the passive acquiescence of some people in certain things without inquiring into, or understanding, them; and that we think just about fits the portions of the "Golden Lights" article that were unjust to the gas industry. We are entitled to say this on the admissions of "Engineering Correspondent" in his letters in our columns on Dec. 5 and Dec. 26, and in the "Daily Telegraph" article of yesterday week. In the first letter, he remarked: "I say quite frankly (after what I have found out on my own initiative during the last few days), that I should not express the same opinion again in such a manner as was done some weeks ago." In the second letter, he said: "I now find that, in my impressions of the progress of electrical engineering—a branch of the profession whose members have kept fairly closely in touch with me through the 'Daily Telegraph' address—I was rather *too ready* to accept statements *from sources at the time considered reliable*." And in the latest "Daily Telegraph" article: "We find that sources of information in which we had great confidence were not altogether reliable." It is to be hoped that those "sources" will exercise a little more discretion in future, as they may rely upon it that the conditions of easy deception and ready reception will not in this connection again obtain in this particular quarter.

THEN AND NOW.

Let us now make a few comparisons to see exactly where we have arrived in ascertaining the solidity or otherwise of the knowledge of "Engineering Correspondent" at the time of the "Golden Lights" article in the "Daily Telegraph" on Oct. 7.

THEN: "The superiority of electric lighting over other forms of illumination has been placed beyond doubt since the introduction of the metallic filament lamp and the improved types of flame arc lamp. . . . For outdoor illumination, such as shops, streets, and workshops, the arc lamp has firmly established its superiority. . . . The golden light from these lamps, providing a remarkably good imitation of sunlight, is unequalled for lighting shop exteriors. . . . They are superior to incandescent gas in all respects."

NOW: "Whitehall and Westminster [high-pressure lamps] have recently been watched carefully. The light from the gas-lamps is very good . . . the gas-lamps score in the many shops where only one large lamp is convenient. The serious drawback to the arc lamp is that there must be at least four in series on 220-volt D.C. circuits. On the A.C. circuits this does not apply. I was, in October, not aware of the replacing since mentioned by you. Some of the districts [where parade lighting by high-pressure gas is extensively the vogue] have been visited. I again come to a question of opinion, and not facts; and remembering the way in which my opinions as expressed in the 'JOURNAL' have been treated, it would serve no good end to continue to express them here."

THEN: "Recent tests of gas for street lighting showed that burners rated at 80-candle power would never give more than 40-candle power; 50-candle power electric lamps gave as much as 53, and never less than 50 candle power."

NOW: "The information was privileged, as is a good deal of that published in the 'JOURNAL.'" [This is the only reply to a request for the details of these tests.]

THEN: "The advantage of running flame arcs is that the economy over any other form of illumination is considerable; but, of course, they are not used for small candle powers. By using four of the six-ampere lamps each of 1500-candle power in series, we obtain illumination at the rate of about 1d. per 1000-candle power per hour." Previous to the foregoing it was said: "If four lamps with carbons cost 6¼d. per hour, each consumer gets his light for 1⅜d. per hour. . . . This economy by combined working is, *of course*, *impossible* with any other illuminant than electricity."

NOW: "The economy of the flame arc is not possible except by combined working." [Dec. 26 letter.] The illustration given by "Engineering Correspondent" in the course of the controversy is from Woolwich, where ten-ampere lamps running in series are charged at £8 each per 800 hours, which works out at 2·4d. per lamp per hour; and we take it these are reputed to be 1500-candle power lamps. This does not work out to 1d. per 1000-candle power. We entirely fail to see how four six-ampere lamps on ordinary voltage will each give 1500-candle power as stated in the "Daily Telegraph" article. If they do, they must be endowed with an extraordinary efficiency. Anyway the price named suggests extremely low-priced current and a small expenditure upon the lamps for running and general maintenance. An explanation of the terms "of course" and "impossible" as used by "Engineering Correspondent" has not been given.

THEN: "An important point for shops is that there are no products of combustion from the electric lamp. These deteriorate the goods, and blacken the decorations of the building. With electricity as the illuminant, the atmosphere keeps healthy and fresh."

NOW: "The original statement was made because the source of information was considered reliable. [Then follows reference to David Greig's provision shops, Dec. 26 letter.] However, since Dr. Marchant's public statement has been given full publicity, the matter should be considered ended." [Dr. Marchant's statement was published in the "JOURNAL" for Oct. 10, p. 94.]

THEN: "That every house should be lighted electrically for the good health of the occupiers is the *unanimous opinion of doctors and scientists*. Electric light generates no fumes, and consumes no part of the air, nor does it give off poisonous products of combustion."

NOW: "When this was written, the writer had been recently informed by a leading medical authority that none of the chief hospitals were lighted by gas." [Further reference is made to this point in succeeding notes.]

THEN: "The pernicious effects of sulphur compounds on paint leather bindings of books, &c., are too well known to need emphasizing."

NOW: "This was the opinion of librarians known to the writer." [Letter Dec. 26.]

THEN: "The flame of a gas-burner pours out as much carbonic acid into the air as two adults."

NOW: "I confess I did not appreciate any difference between carbonic acid gas sterile and that which is not sterile."

THEN: "A further important point should appeal to the householder: the absence of danger of explosion and fire" [with electric lighting].

NOW: "The *only* answer to this is that, so far as the writer can discover, none of the leading fire insurance companies make any distinction."

A LONG LIST OF AUTHORITIES.

We see from this how lean in the knowledge that backed it, and yet how unjust to the gas-supply industry, was the article that initiated this controversy; and, we may say, how easily "Engineering Correspondent" was misled by those whose information he thought reliable—those whose interests lie in the direction of doing their best to sully those of the gas industry, and those whose information led to the positive statements in the "Daily Telegraph." "Engineering Correspondent" has not now stated who was the single leading medical authority whose statement induced him to speak of the "unanimous opinion" of doctors and scientists; nor does he tell us who were the librarians upon whose opinions he relied. We have also tried—but tried in vain—to get him to put names to the "poisonous products" of which he spoke from incandescent gas-burners. We have tried, but tried in vain, to get him to put some quantitative value upon them, by taking the concrete case of a burner consuming a definite quantity of gas. He has learned that there is a difference between the innocuous carbonic acid from the combustion of gas and the noxious carbonic acid from human respiration. All gas undertakings have medical men as customers and as constant users of gas. Apart from them, if we started upon

the rebutting evidence we have immediately at hand, we should have to quote as authorities doctors and scientists who have made investigation during the last forty years—stage by stage in their investigations carrying forward the confirmation from the health point of view. We start from Dr. Thomas Stevenson, Dr. C. Meymott Tidy, Dr. Odling, Dr. W. J. Russell, Dr. Angus Smith, Dr. Richardson, Dr. Whitelegge, and Dr. W. A. Aikin. We pass on to Professor Carlton Lambert, Professor Frank Clowes, Sir Henry Burdett, Pettinkofer, Professor Percy Frankland; and then to Professor Vivian B. Lewes, Dr. Samuel Rideal, Dr. Bertolacci, Mr. Otto Hehner, Herr W. Weichardt, Dr. Toogood, Dr. Bowie, Dr. Vincent, and Mr. G. Stanley Cooper, B.Sc. Then we have the results of the "Lancet's," the South Metropolitan Gas Company's, the Glasgow, and the Leeds University experiments. There are, too, the findings of Lord Rayleigh's Committee in connection with their investigation in 1904 into the Metropolitan Gas Supply. We could no doubt quote more by a little research, including cases of insanitary atmospheres in electrically lighted buildings. "Engineering Correspondent" has had the misfortune to pay occasional visits to the electrically lighted "Patent Office." His testimony is: "It is truly a depressing room. It is badly ventilated. . . . If any one can work long in the atmosphere of the Patent Office library, he must be used to doing his mental work under conditions which show that he can stand almost anything." We should like to know if "Engineering Correspondent's" informants can produce a list of authorities of similar eminence and qualification who have actually, chemically and medically, investigated the subject from the health point of view. Those quoted above have made careful research; and the weight of their findings crush the puny, but disgraceful, efforts of the electrical rivals to besmirch gas. It is not much use asking some local doctors their opinions on this subject, as suggested by the "Engineering Correspondent" of the "Daily Telegraph," as very few medical men have made a thorough chemical investigation into it; and it is only within the last few years that experience with gas-fires has shown them the falsity of former opinions, superficially formed, and without scientific considerations and proofs.

Gas and Leather Bindings.

As to the statements of unnamed librarians regarding the effects of gas on the leather bindings of books, scientific and technical evidence does not confirm any such damage. We go back to the seventies, to the evidence of Mr. James Layton, a bookbinding expert, before a Parliamentary Committee. He then spoke of the results of investigation dating right back to 1843. At the Athenæum Club, he found absolutely no difference in the condition of books in a room in which gas was burned, and in that of books in a room in which gas was not burned. Extreme top temperature and bad ventilation were, in his opinion, the causes of damage. In one room where no gas was consumed, there was high temperature owing to the proximity of the kitchen flues. There the books were injured. At the Royal Institution, he stated that he found books quite as bad in the library where gas was then used only occasionally as in libraries where it was used almost continuously. Coming down to Lord Rayleigh's Committee in 1904, the evidence of Mr. A. G. Vernon Harcourt and Dr. J. Gordon Parker, both pointed out that sulphuric acid was used in the preparation of leather; and one of Dr. Parker's remarks was: "It is not sufficient to find free sulphuric acid in leather to put gas down as being the cause of decay, as sulphuric acid is frequently used both in bleaching leather and in the dyeing process by the manufacturers." The Committee presided over by Lord Rayleigh consisted of Sir W. Abney, Dr. Farquharson, Mr. William King, of Liverpool, and Mr. [now Lord-Justice] Fletcher Moulton. This Committee reported that it did not appear that any complaints were made by the inhabitants of other districts on the ground that gas unpurified by lime causes injury to health, or is more destructive to articles such as leather, &c., than it is supposed to be in London. In the face of this striking fact, the Committee were of opinion that those who contended for the maintenance of the clauses relating to sulphur compounds (other than sulphuretted hydrogen) had not sufficiently shown that their abolition in the case of the London Companies would be detrimental to the public. We are curious as to whether the "Engineering Correspondent" will be prepared to set his unnamed authorities against our named ones, upon whose statements in every instance hand can be immediately laid.

Electrical Fires.

We are surprised that a student of electrical matters, and one who is kept in close touch with events concerning the electrical world, has no other reply than the one that "Engineering Correspondent" advances regarding electrically generated fires. If he will refer, on his next visit to the Patent Office Library, to the "Electricity Supply Memoranda" published in the first number of the "Journal" in each of the past few years, he will find a list of some rather exciting catastrophes that have had electrical origin. The report of the London Fire Brigade also affords some enlightenment on the subject [see "Journal," March 21, 1911, p. 824]. The Acting Electrical Engineer to the City Corporation likewise had some remarks to make on fires of electrical origin in his annual report ["Journal," Dec. 19, p. 813]. Three of the fires, he stated, were of a most serious nature. It is a pity our friend's informants should have been so reticent on these matters.

High Winds and Mantle Destruction.

In the "Golden Lights" article, "Engineering Correspondent" asserted that "a high wind soon reduced gas mantles to ruins, but, of course, left the electric lamps unhurt." We suggested that probably he had never heard of windproof gas-lanterns; and of the longevity—in practice, and not in imagination—of the inverted gas mantle upon its rigid support. Now what is the nature of his answer to this [see letter Dec. 26]. He begins with the remark; "Concerning the windproof *mantles*." We said "lanterns." The difference will be appreciated by anyone considering the physical characteristics and purposes of the two. However, he states that on Sunday, Nov. 26, and on Nov. 19 (both Sundays when parade high-pressure lamps are not lighted up), the bye-passes along the Lewisham High Road were counted at about 7 p.m. May we point out again that "mantles" are the subject, and not "bye-passes." However, the 19th was a *very* windy night; the 26th fairly windy. On the 19th, twelve out of 71 bye-passes were blown out; and on the 26th, 8 out of 71. "Engineering Correspondent" does not inform us whether he himself counted the bye-passes, or whether he had a deputy in the Lewisham High Road on those dates at the hour named, or whether a local electrical official was the enumerator, or whether he merely gives this information on hearsay. The bye-passes he acknowledges had then been exposed to the wind for 21 hours. Suppose we accept his statement, then it proves that on the day of the "very high wind" 59 lanterns successfully resisted the efforts of the gale to extinguish the bye-passes, which shows that lanterns can be made windproof. But let us ask whether it is fair to take such abnormal atmospherical conditions as existed on the nights in question? When there is a failure of electric supply, all the electric lamps in a district—street, private, shop, and in places of entertainment or worship (perhaps large audiences are assembled)—collapse with one accord. There is then no question of merely individual lamps failing; the extinction is on a wholesale scale. But there is no allegation here as to the mantles having collapsed during these abnormal conditions; and "mantles" are the things that were in question. Had mantles been referred to instead of bye-passes, we should have asked the gas company to kindly supply the confirmation or otherwise from their maintenance books. We have to complain of the general statement made as to the condition of the mantles in an undesignated wide thoroughfare. It is not stated whether the lamps referred to were private or public ones; so we do not know who were responsible for their maintenance. If the gas company were, there would have been an opportunity of making some investigation. As it is, we are precluded from doing so. There is no necessity for gas-lamps to be in an improperly maintained condition.

Cost of Lighting.

We now come to the letter that appeared last week (p. 94); and it is a most disappointing performance. Really there is not much in it to criticize, or upon which to afford further information. We cannot make bricks without straw; and "Engineering Correspondent" does not afford us even the satisfaction of being provided with substantial material upon which to work. He finds that the mass of figures with which we supplied him on Nov. 28 are not convincing to him—whatever they may be to other intelligent readers—for certain reasons, which he characterizes as "general," and the appropriateness of the qualifying term we admit. If the figures will not convince him, then we do not know what will do so, seeing that those quoted are, in the main, tendered competitive figures by both gas and electricity suppliers, and, in the case of gas, they are commercial figures and actual working figures. In this connection, he may be referred to the editorial article on the Westminster street lighting in this issue, and to a table of actual illuminating powers and costs given on p. 157 to-day.

Compression Costs.

It seems difficult to drum it into our friend that local conditions play an important part in the question of costs. Take his point as to the cost of compression. Of course, it varies in different places—depending on the size of installation, and many other considerations. There may be a very wide difference between the actual and the maximum number of lamps with which a compressing plant deals and can deal; and there is also the question as to the cost of the power for driving the compressor. In the case of parade lighting with a large connection of lamps, the cost per lamp is much lower than when the business on any given installation started, and there were only a few lamps connected. Then take private high-pressure plants driven by a small electric motor, the electricity suppliers in some cases show their talons and spite by charging the maximum lighting rate permissible per unit for the energy required for these motors; while, in other instances, the electric undertakings evince a much more open and tolerant spirit by supplying the current at the prices at which other consumers using motors of low power are charged. "Engineering Correspondent" might do something to kill the petty vindictiveness shown in this matter by the electricity supply industry by dealing with it boldly, and ridiculing it, in the columns of the "Daily Telegraph." Some information upon which he could work will be found in the "Journal" for Dec. 5 (p. 673). This, at any rate, will assist him to see that compression costs are caused to vary by various factors.

Electrical Tender for Draper's Shop Lighting.

"Engineering Correspondent" says that the figures for electricity for lighting the draper's shop referred to on p. 597 of the "Journal" for Nov. 28 are "hopelessly mixed up." He must not blame us for any defects in that connection. The figures were

taken from an actual tender by the Electricity Department of a London Borough, which department recognized them, and wrote the letter—or one of the officials did so—that appeared on p. 769 of the "JOURNAL" for Dec. 12, which showed that the department had been willing to sacrifice a further 25 per cent. of their original offer, and to do more than that, rather than let high-pressure gas-lighting go into this particular shop. "Engineering Correspondent" should read this second letter, and our comment upon it, which by-the-by has not been answered by the gentleman who chose the apposite pseudonym "Not Good Enough." He ("Engineering Correspondent") will discover on perusing it a still more hopeless mixing up of the figures; and he will find that—though there are some highly trained electrical men at the head of the department in question—the commercial soundness of the tenders is open to the gravest doubt. Is this the sort of thing that has appealed to "Engineering Correspondent" as showing that within the limits of his experience, "electrical engineers have been more enterprising than their rivals?" "Engineering Correspondent's" own figures, in this connection, appear to be "hopelessly" mixed up. We make out, for instance, that 3232 units at 4½d. total to £60 12s., and not to £15; and if our calculating faculty is not at fault, then this upsets his exercise in arithmetic. As to maintenance, there is no need in the case of the draper's shop in question to raise the charge by applying to it any of the figures from Ilford. The gas company in question are satisfied with what they are doing in the matter; and as Mr. W. B. Farquhar, of Ilford, has pointed out, the figures under one set of local circumstances cannot be applied to a totally different set of conditions.

WATER-CRESS MISSION.

As to this installation, it is untrue to say that an old installation of electric lighting is being put into competition with a new gas installation. If "Engineering Correspondent" will take heed of the figures given on p. 598 of the "JOURNAL" for Nov. 28, he will find the number and make of the electric lamps set out in detail; and only 20 per cent. of the total were of the old carbon type. We did not hide anything in connection with this example. The tests made were honest ones. The actual metered consumption, under the conditions named, showed an average of 2¼ watts per candle per hour. If this does not meet with the ideas of "Engineering Correspondent," so much the worse for the lamps. But apart from this, he will see that a calculation was made in this conjunction on the basis of 1·1 watts per candle power; so that there could be no question of taking any unfair advantage. On this basis, the results worked out at 5·814d. for gas lighting per hour, against 2s. 3¾d. for electric lighting, on the basis of candle power for candle power. The electrical engineers may go on refuting; but, if they do so, do please let us know the lines that their refutation takes. It may be that useful maximum beams are sent out at about 0·5 watt per candle power; but in practice the consumer has to pay for other than 0·5-watt beams.

Really we looked for something better from "Engineering Correspondent"—we should certainly not expect this from any man with a scientifically trained mind capable of submitting to examination scientific laws and facts—than an attempt to give support to a sadly wrecked case by submitting such twaddle as this: "It is, of course, claimed by the electrical engineers that the capacity of the rooms is decreased by the use of gas. The theatre proprietors seem to think so; and this appears to be the view of the factory inspectors." Now as "Engineering Correspondent" has submitted this as part of his case, will he give us some scientific reason for the statement—never mind what electrical engineers with commercial ends claim, or which "seem" or what "appear" to be? Let us have a proper reasoned explanation for what in the meantime, on our own knowledge, we shall treat as an utter absurdity.

WOOLWICH SHOP LIGHTING.

Dealing with this matter, "Engineering Correspondent" may continue from the figures he gave to maintain that electricity is cheaper than gas. We maintain, on the figures we gave, that gas is the cheaper; and customers of the gas company think so too. He must not say that the gas for this parade lighting is being sold at what "appears" to be an unsound commercial proposition. It is weak—very weak—for an electrician to talk about the figure for gas for such a class of business as this not coming out at anything like that at which it is sold to householders. It is sold at a price that produces a profit, and that is more than can be said for much of the electricity that is sold as a matter of "expediency," and then saddling the private consumers with all the capital and standing charges.

Regarding the flame arcs of the Engineering and Arc Lamp Company, Limited, of Chingford, it is a high efficiency—we make it about 3·5 candles per watt—that is attributed to these small lamps. The efficiency about matches that of the large high-grade flame arc lamps that Professor Morris tested some time since; and it would be interesting if he would check the claim.

As to the instance of a combined working electrical shop lighting scheme that "Engineering Correspondent's" explorations have enabled him to discover, it may interest him to know that our investigations have disclosed, under the parade lighting schemes in London, approximately 9000 lamps in use. He will see that this means a fairly substantial revenue; and with a business of this kind, and a still growing business, his own commonsense must assure him that the gas companies would not engage in it at a loss, and a growing loss (if his surmise is correct) for every additional lamp connected, and for every day the canvassers are at work attempting to get fresh orders.

Concerning the top arc lamps in the Woolwich illustration (which were, instead of the fact of their existence being divulged, carefully shut out of consideration by the Electricity Department of Woolwich, as well as by "Engineering Correspondent)," in the communication to our columns by the latter on Dec. 5, he stated that these lamps could not affect the photometer readings by 5 per cent. The 5 per cent. has now risen to 10 per cent. "Engineering Correspondent" veers about a little; and he has manifestly not a great opinion of the distance carrying power of the useful beams of the flame arc lamps. Perhaps the point at which the tests were taken was not the "special direction" referred to in an article by "Engineering Correspondent" in the "Daily Telegraph" towards the end of June, when he remarked: "It is perhaps well to issue a word of warning that many of the arc lamps sold as being of a certain candle power only give that illumination in one special direction."

A STRANGER TO HIGH-PRESSURE VERTICAL BURNERS.

We almost feel inclined to make merry over the paragraph: "Surely Mr. Bradley's figures refer to high-pressure inverted mantles? I have never seen the 985-candle power upright 'lanterns,' and suppose it would take some 15 mantles to get it." Is "Engineering Correspondent's" knowledge of gas-lighting advances so very modern that he did not know that the predecessors of the high-pressure inverted lamps were high-pressure vertical burner lamps, worked at much lower pressures than the present-day high-pressure inverted lamp? There are lamps to-day fitted with one upright burner and one mantle that will produce 1000-candle power, on what is a comparatively low pressure nowadays—8 to 10 inches.

A FINAL QUESTION.

There is no other point that really requires to be dealt with. But we will conclude by asking "Engineering Correspondent" whether, under the following conditions, the words quoted are the truth. In a given district, supplied with gas that has been made and stored in the holders at the works during the previous few hours, and sent out at a uniform governed pressure from the works, it is possible to obtain such widely diverging results as are here inferred: "Early in the evening, one can adjust a burner to give (say) 100 per cent. light; but an hour later, it is giving 50 per cent. light. Adjusted again, and two hours later there is not the same candle power." With a long experience as a consumer, and in photometrical testings for information purposes, the present writer could not have truthfully written the words quoted from "Engineering Correspondent's" final letter.

However, if we have come to the end of the present controversy as seems probable from the concluding words of the letter published last week (we leave this entirely to the discretion of "Engineering Correspondent"), we, too, are pleased that the discussion has not been degraded by personal abuse, though we must say that our friend, who has mentioned the matter more than once, seems to have been pleasantly surprised that it has not, which, to say the least, is not altogether complimentary to us.

GAS AND ELECTRIC COOKING.

The Use of the Meat-Roaster in Gas-Ovens—Misrepresentation by the Electricity Publicity Committee's Literature.

SINCE the article headed "Rational Gas Cooking" appeared last week (p. 81), there have been larger opportunities of testing the effect of the use of the Marks' meat-roaster and heat-distributor in a gas-oven; and in all respects the claims of Mr. Marks have been borne out. The difference between the weight of raw and cooked meat is less when baked in the roaster than when roasted in the open oven. A larger proportion of the juices is retained in the meat while being cooked; and there is no question that, when carving commences, there is a greater escape of gravy from the meat than when cooked in the open oven. With the roaster in use, there is no smell of burning fat while cooking is proceeding; and the oven in which the trials have been carried out has been kept perfectly clean, and has required no special attention in the way of cleaning. There is another point. It has been found with the roaster that less gas is required for roasting a given weight of meat. That again is an important consideration in a house in which all the cooking is done by gas from Jan. 1 to Dec. 31. The result is that the powers that be where the tests have been made would not be (altogether beyond any consideration of the money economy) without a meat-roaster for use in the gas-oven—the advantages and kitchen savings have, without any outside assistance, carried their appeal home.

The Electricity Publicity Committee are hastening up with their cooking literature, as they announced they would in their new "Journal." They are proposing an illustrated poster 40 inches by 25 inches. This will show an old-fashioned coal range and an electric oven, but not a modern gas-cooker, though the electric oven looks much like one. In the centre of the room are two joints—ribs of beef—with the human equipment of legs, feet, arms, hands, and faces. The joint out of the coal oven presents an emaciated, down-at-the-mouth appearance; while the joint out of the electric oven has a bloated face, with all the characteristics about it of

an East-end hooligan or the landlord of a beer shop. It is proposed that the posters shall be supplied at 28s. 6d. for fifty.

But for £1 12s. 6d. per 1000, or £1 10s. per 1000 for quantities of 5000 and above, those responsible for the running of electric undertakings can obtain one of the most flattering leaflets with reference to electric cooking, and one of the strongest pieces of misrepresentation of cooking by gas that we have so far seen. Managers of gas undertakings will do well to watch for the circulation of this leaflet in their areas. Throughout it, cooking by gas is allowed only the same level in the matter of result as cooking by coal. On the front there are three pictures—a leg of mutton, as bought from the butcher's, very slightly reduced (in fact, the meat appears to have swollen) as cooked by electricity, but, in the third illustration, much reduced as cooked by coal or gas. Overleaf it is stated that, on a 12-lb. joint, 3s. or 4s. worth of meat is lost by cooking on the "old-fashioned methods." Apart from the question of the extent of loss by any method of cooking, to be technically correct is it "meat" that is lost? Of course it is not. Meat contains a large percentage of water; and its evaporation causes a considerable loss in weight. The Electricity Publicity Committee are not over-scrupulous as to exactitude in their statements, as witness—"Gas cooking is slightly *more* wasteful of *meat* than coal cooking."

Then we see some results as recorded by Mr. R. Borlase Matthews of cooking in electric ovens. It is admitted, however, that the figures are examples of what may be done under "ideal" conditions—an expert electrical cook having carried out the tests. But "the loss is actually 60 to 70 per cent. less than that incurred in cooking by coal." Now as, according to this electrical leaflet, the "gas cooking is slightly more wasteful than coal cooking," it follows that (electrically speaking) the loss must be greater in cooking in a gas-oven. These are the results under the "ideal" electric conditions and the use of an expert electrical cook: (1) 6 lb. 4 oz. of mutton weighed 5 lb. 14 oz., when taken out—a loss of only 6 per cent. (2) 9 lbs. 6 oz. of mutton weighed 8 lbs. 12 oz. when cooked—a loss of only 6¼ per cent. (3) 7 lbs. 8 oz. of beef was reduced to 6 lbs. 14 oz.—the loss being 8¼ per cent. (4) 6 lbs. 4 oz. of beef when taken out weighed 5 lbs. 11½ oz.—a reduction of 8½ per cent. However, with an electric cooker it is claimed that the wastage can be reduced to one-half that which occurs under the "best" conditions with "coal or gas." Under the "best" conditions! This claim is untrue.

At the end of the leaflet appears a table, from which we take three representative lines to illustrate its nature:

Weight of Meat Available for Serving.	Amount of Meat to be Purchased when Cooked.		Saving in Weight.	Saving in Cash at 10d. per lb.	Cost of Cooking with Electricity at 1d. per Unit.
	Electricity.	By Coal or Gas.			
Lbs.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	s. d.	d.
4	4 8	5 11	1 3	0 11¾	1¼
8	9 2	11 7	2 5	1 11	2¼
12	13 10	17 2	3 8	2 11	3

On the strength of these figures, it is stated that "if coal or gas cost nothing, and the price of electricity were twice as much as is actually the case, it would be still cheaper to cook a joint of meat by electricity."

Now we take it that, as the name of Mr. R. Borlase Matthews is mentioned in the leaflet, and as it was announced in the Electricity Publicity Committee's "Journal" that he was writing some pamphlets on electric cooking, he is responsible for the figures in this leaflet. When writing on this announcement in our issue for Jan. 2 (p. 23), we remarked: "We hope Mr. Matthews will do the manly thing—that is, state the names of the makers of the stoves used in the tests, the nominal distinctions of the stoves (with sizes), the district or districts in which the tests were made, the prices of gas and electricity for cooking purposes, who made the tests, and any other information for the tests to be repeated." If he is the person responsible for the figures under the heading of the column of the table in the leaflet headed "Coal or Gas," he has not complied with our request. Moreover, we assert that he (or whoever is responsible) has not shown what can be done with a properly constructed gas-oven by applying correct, and the "best," methods. The table, in its reference to gas, is thus a misrepresentation.

The World's Largest Bye-Product Coke-Oven Plant.—According to a circular which has been issued relating to the great Koppers bye-product coke-oven plant erected at Gary by the Indiana Steel Company—a subsidiary of the United States Steel Corporation—it is the largest and most complete bye-product coke-oven plant in the world. It comprises eight batteries of 70 ovens each; making a total of 560 ovens. The capacity per charge of each oven is 12¾ tons; the coking time is 18 hours. The daily coal consumption is 9500 net tons, and the yield of coke is 84 per cent., or 8000 tons; the bye-products consisting of ammonium sulphate and tar. The gas produced daily is 95 million cubic feet, of which 50 per cent. is used in the steel-mills and the rest in heating the ovens. The cost of the plant is given as £1,200,000. The number of Koppers ovens erected since 1902, or under construction on Nov. 1, 1911, is 7230.

GAS BILLS FOR 1912.

[Second Article.]

This week we commence the notice of the Bills introduced by Gas Companies who already possess statutory powers under Private Acts.

Reviewed in alphabetical order, the Annfield Plain Gas Bill first claims consideration. This Company have, since their Act of 1907, been progressing by rapid strides. The whole of the share capital of £36,000 then authorized, and £9000 of the £12,000 of borrowing powers, have been raised. In order to meet the demand for gas, additional works on land adjoining the present works at Kyo are requisite; and powers are desired. The Company ask to be empowered to supply gas in a small portion of the parish of Iveston and also within a part of the urban district of Stanley. The Shotley Bridge and Consett District Gas Company have authority to supply in Iveston; but, as no supply has been given by that Company in the portion of the parish upon which the present promoters have cast eyes, it is sought to have the unexercised powers repealed. As to capital powers, the Company seek sanction to the raising of an additional £39,000. Upon such portion of this capital as is issued as ordinary, the standard dividend is to be 7 per cent.; and on the preference capital, 5 per cent. Borrowing powers upon the new issued capital are proposed on the ordinary lines of one-third. A profit-sharing clause in favour of the employees is included. A stand-by clause in respect of gas is sought; and another provision is intended to relieve the Company from the obligation to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of the main is insufficient for the purpose, or if, and so long as, any such supply would, in the opinion of the Company, interfere with the sufficiency of the gas required to be supplied for lighting purposes. Where premises cannot conveniently, or without undue expense, be supplied from any existing main, the Company ask to be allowed to provide and fix the necessary plant for the generation of acetylene, gasolene, or suction gas, or any other gas. [*Parliamentary Agents: Messrs. Lees and Co.*]

In the preamble to the next Bill, the Bognor Gaslight and Coke Company submit that they are in a position to utilize their present lands, machinery, and works to a greater extent by being empowered to generate and supply electricity within their present area. The clauses that succeed give all the necessary powers; and the Company propose to be bound to afford, within three years after the passing of the Act, a reasonable service in a scheduled area. The Company ask for additional capital powers to the amount of £30,000; but if within three years they have failed to commence to exercise the powers of the Act with reference to the supply of electricity, the authorized capital is to be reduced from £30,000 to £12,000. The dividend proposed on the additional capital is 7 per cent. on the portion issued as ordinary, and not exceeding 6 per cent. in respect of preference. Borrowing powers up to one-third are asked for. Separate accounts as between the gas and the electricity undertakings are to be kept. [*Parliamentary Agents: Messrs. W & W. M. Bell.*]

An extension of limits, new gas-works, and capital powers are sought by the Christchurch Gas Company. The Company have so far raised £18,080 of original 10 per cent. capital, £5000 7 per cent. capital, £5000 6 per cent. preference, and £8750 of mortgage debentures. There is £6920 of original capital unissued under the Act of 1877; but the Company desire that this shall be raised as additional capital. We find the modification of section 7 of the Act of 1847 to which attention was called in dealing with the Herne Bay Bill last week proposed in the present instance. The promoters contemplate an extension of the limits of supply to the parishes of Hordle, Milford, Milton, and Sway. In addition to the £6920, the Company seek power to raise additional capital not exceeding in the whole £30,000. On the additional capital issued as ordinary, the dividends are not to exceed 7 per cent., or on the preference capital 6 per cent. The promoters desire to borrow, in respect of the Act of 1877, a sum (inclusive of £8750 already borrowed) of £9360; and in respect of the additional capital which the Company may be authorized to raise (including the £6920) on the lines of one-third of the capital issued and paid up. Power to create a special purposes fund is desired. As from Jan. 1, 1913, it is intended that no person shall be appointed as an auditor who is not either a chartered accountant or an incorporated accountant. Land and works powers are included in the measure; and as to illuminating quality in future, it is proposed that it shall be 14 candles, tested by the "Metropolitan" No. 2 burner. A stand-by clause appears in respect of both gas and electricity. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Dunstable Gas and Water Company have introduced a Bill relating to both their gas and water undertakings. On this occasion, we will only deal with the provisions relating to the gas portion of the concern. In connection with the gas-works, the amount of existing capital is £16,968; and there has been borrowed £2500. The additional gas capital asked for is £10,000; such part as is issued as ordinary capital being entitled to a dividend of 7 per cent., and as preference to a dividend of 5 per cent. The Company desire to have power to borrow up to one-third of both the original and additional capital. On borrowed money, it is proposed that interest not higher than 5 per cent.

shall be paid. The remaining provisions relating to gas are in the usual terms. There is the prepayment meter clause; and a provision prescribing 14-candle gas as the standard of quality, tested by the "Metropolitan" No. 2 burner. It is suggested that the number of Directors shall be reduced to not more than five, and not less than three. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Brighton and Hove Gas Company, the East Cowes Gas Company, the Lea Bridge Gas Company, the Maidenhead Gas Company, the North Middlesex Gas Company, the St. Albans Gas Company, and the Southgate and District Gas Company are the joint promoters of what is known as the Gas Company's (Benefit Funds) Bill. It is proposed that the Act shall come into force on Jan. 1, 1913. The novelty of the measure suggests the setting out *in extenso* of the main clauses—Nos. 3 to 8.

3.—The Directors of the Company may, if they think fit, in respect of any year appropriate out of the revenue of the company as part of the expenditure on revenue account any sum not exceeding ½d. per 1000 cubic feet of gas supplied by the company during such year to a fund to be called the "Benefit Fund": Provided that the amount of the sums so appropriated and for the time being standing to the credit of the benefit fund shall not at any time exceed the amount which the directors of the company would have been entitled to appropriate to the benefit fund out of the revenue of the company at the rate aforesaid during the then preceding five years.

4.—(1) The directors of the company may out of the benefit fund grant a gratuity of any sum or make pension or other allowances payments or benefits to any of the servants of the company who may be disabled or injured in or may be retired from, or become incapacitated through, age, permanent injury, or other infirmity from continuing in the service of the company, or to the widow, or family, or dependents of any such servant, and on such terms and conditions as to contributions by such servants or otherwise as the directors of the company may think fit: Provided that it shall not be obligatory on any present or future servant of the company to become a party to any arrangement made under this Act for securing to him or his widow, family, or dependents any gratuity, pension or other allowance, payment or benefit: (2) The benefit fund shall be applicable for the purposes of this Act and for no other purpose whatsoever.

5.—The directors of the company may enter into, and carry into effect, agreements with any insurance company or other association or company for securing to any such servants, or the widow, family, or any dependent of any such servant, gratuities, pension, or other allowances, payments or benefits as aforesaid, and may make payments out of the benefit fund for the purpose of any such agreement.

6.—The moneys forming the benefit fund or any portion thereof shall be invested in securities in which trustees are by law authorized to invest, or in such other securities as may be authorized by resolution of the company.

7.—Every gratuity, pension, or other allowance, payment, or benefit secured, made, or granted under this Act shall be payable to, or in trust for, the servant, person, widow, or dependent to whom the same shall be granted, and shall not be assignable or chargeable with the debts or other liabilities of such servant, person, widow, or dependent as the case may be.

8.—If the company shall under the powers of this Act make any scheme involving contributions by their servants, such scheme shall not come into operation until the company shall in respect of that scheme have been registered under the Friendly Societies Act, 1896, and the provisions of that Act (except the proviso to sub-section (1) of Section 8 and Section 41) so far as they are applicable, and are not inconsistent with the provisions of this Act shall apply (*a*) as if the company were a society to which that Act applies, and were the trustees of such society, (*b*) as if the scheme were the rules of such society, (*c*) as if the benefit fund were the funds of such society, and (*d*) as if the servants contributing to the scheme were the members of such society.

These proposals constitute the whole of the measure. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Gas Company (Standard Burner) Bill is in the same form and terms as that of the famous joint measure of 1910. The promoters are the Ashton Gas Company, the Brierley Hill District Gaslight Company, the East Grinstead Gas and Water Company, the Folkestone Gas and Coke Company, the Gravesend and Milton Gaslight Company, the Horley District Gas Company, the Portsea Island Gaslight Company, the Redhill Gas Company, the Rugby Gas Company, the Southend Gas Company, the Stroud Gaslight and Coke Company, the Sunbury Gas Consumers' Company, Limited, the Sutton Gas Company, the Town of Dudley Gaslight Company, and the Whitby Gas Company. It is proposed that the Act shall come into operation on Jan. 1, 1913. Then follow the clauses substituting the "Metropolitan" No. 2 burner for existing standard burners, and defining the conditions and the method of testing with the new burner. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Houghton-le-Spring District Gas Company—owing to the increasing demand for gas, and to the fact that districts adjacent to their own area are without a supply of gas—are asking for more capital, and for an extension of the limits of supply. It is desired to include in the authorized area East and Middle Herrington, West Herrington, Painshaw, South Biddick, Bournmoor, Little Lumley, and Morton Grange, all in the county of Durham. The capital authorized by the Company's Act of 1879 was £20,000, and loan £5000. These powers have been exercised to the full. Additional capital powers to the amount of £30,000 are desired. Including the £5000 already borrowed, it is sought, in respect of the 1879 capital, to be allowed to borrow £6666, and up to one-third of the additional capital to be authorized by the present Bill. The portion of the additional capital issued as ordinary, it is suggested, shall be entitled to a dividend of 7 per cent., and the part issued as preference to 6 per cent. It is proposed to repeal the section of the Act of 1879 referring to the price of gas. In substitution, it is contemplated that the price shall not exceed within Houghton-le-Spring 4s. per 1000 cubic feet, and 4s. 6d. within all other portions of the limits of supply. The Company desire to be exempt from penalty for neglect or refusal to give a supply of gas to any company, body, or person who uses, or is in the habit of using, machinery or apparatus for making and utilizing suction gas, if and so long as the giving of a supply would interfere with, or jeopardize, the supply of gas for public and private lighting, and to consumers not using such machinery or apparatus. Any difference in respect of this matter, it is proposed, shall be referred to arbitration. Then follows a stand-by clause referable to private gas plants. Request is made for power to create a special purposes fund. Following a proposal to repeal the standard burner section of the Act of 1879, are clauses providing for an illuminating power of 14 candles, with the "Metropolitan" argand burner No. 2. The Company desire to be empowered to apply for a Provisional Order for electric lighting. [*Parliamentary Agents: Messrs. Crowders, Vizard, Oldham, and Co.*]

The Leatherhead Gas and Lighting Company have a paid-up capital amounting to £37,672 15s. 6d.; and adding to this £292 15s. 6d. received as premiums, there remains authorized, but unissued, capital, amounting to £2327 4s. 6d. There have also been created and issued £9300 of 3½ per cent. debenture stock, leaving unexercised borrowing powers to the extent of £700. The Company are now forward with a Bill, the principal proposal in which is the acquisition of the Cobham Gas Company, the total paid-up capital of which is £16,360, with 4 per cent. debenture stock to the amount of £5450. An agreement for purchase has been entered into, and is operative on June 30 next. Debenture stockholders are to receive an equal amount of 4 per cent. debenture stock in the Leatherhead Gas Company, or, at the option of the holders, they are to receive the full face-value of the debenture stock. To the Cobham shareholders £2 10s. is to be paid for each share, or at the option of the holders, the exchange for every four £10 shares held one such share of the Leatherhead Company. Among other considerations, the Leatherhead Company are to pay to each shareholder of the Cobham Company who, under the agreement, has had allotted to him a share or shares in the Leatherhead Company, a bonus of 10s. for each share in the Cobham Company surrendered by him. All the clauses necessary to the transfer and to give effect to the agreement are in the Bill, including the issue of debenture stock to satisfy the claims of debenture holders in the Cobham Company. After the transfer, all the powers conferred by the Leatherhead Gas Act of 1901 are to apply to the Cobham area. The promoters are asking for authority to raise additional capital to the amount of £40,000, to which the powers as to dividend of the Act of 1901 will apply. In addition to the borrowing powers under the 1901 Act, and to the 4 per cent. (Cobham) debenture stock to be issued under the powers of the present measure, the Company ask for power to borrow firstly an additional sum not exceeding £3333 in respect of the existing capital authorized by the Act of 1901 (being the difference between one-third and one-fourth of the capital thereby authorized), and, secondly, up to one-third of the additional capital to be raised under the present measure. Power is to be taken to create a special purposes fund. A number of provisions in former Acts—relating, *inter alia*, to maximum price, standard burner, and quality of gas—are to be repealed. It is proposed to enact that the price of gas within the Cobham district shall not at any time exceed that for the time being charged in the Company's district by more than 6d. per 1000 cubic feet; but the price so charged in excess shall not be taken into account in calculating the rate of dividend payable under the Act of 1901. The standard illuminating power is proposed at 14 candles, as tested by the "Metropolitan" No. 2 burner. A suction-gas plant clause similar to that in the Houghton-le-Spring Bill is included, as well as a stand-by clause, proposing to entitle the Company "to receive as a standing charge, in addition to the price of the gas actually supplied" to the consumer "a fixed sum to be determined by them not exceeding £5 per annum." There is also a stand-by clause applying to electricity. [*Parliamentary Agents: Messrs. Hargreaves and Crowthers.*]

Concrete materials for the Catskill aqueduct have been subjected to several kinds of tests to determine their fitness for the work. In 1910, in addition to the usual tests for strength, &c., a series of percolation tests to determine the solubility of various rock aggregates was concluded by the Board of Water Supply of New York City. In the latest annual report of Mr. J. Waldo Smith, the Chief Engineer, it is stated that no definite evidence of solution of aggregate was obtained; on the contrary, it appeared that solids carried off by the percolating water came from the cement. In order to determine the extent of the consequent weakening, nine specimens, 8 inches diameter and 6 inches high, were tested in compression, and developed an average strength of only about 800 lbs. per square inch, which, under normal conditions of storage in damp sand, according to the report, would undoubtedly have reached about 300 lbs. per square inch. An examination of all the broken specimens indicated that the solution was confined to the cement in the main channels of percolation. Further tests were started in 1910. During the year 1,175,800 barrels of portland cement were tested; and of this amount, 95·44 per cent. was accepted.

ILKESTON GASHOLDER DISASTER.

WORKS PARTIALLY DISMANTLED AND HOUSES FLOODED. A GIRL DROWNED.

Our readers have already gathered a more or less accurate description of the extraordinary and unprecedented catastrophe that occurred at the Corporation Gas-Works, Ilkeston, at about 1.30 p.m. yesterday week. About two years ago we gave some details of the extensions and enlargements of these works on modern lines, including coal and coke conveying machinery and mechanical stokers. And it may be remembered that the extensions included a gasholder, on the Gadd and Mason system, without external guide framing, in steel tank. The concrete foundation for the tank was at ground level, there being reasons why an excavation was undesirable, so that the whole structure was above ground. The tank was 115 feet diameter and 26 feet high; and there were two lifts—respectively, 110 ft. 6 in. and 108 ft. in diameter. It may be observed that provision was made for the addition of a third lift at some future date. This holder was situated at the north-east corner of the plot of land covered by the works, and near by was a smaller and older holder of about 250,000 cubic feet capacity, two lift, in a below ground brick tank, with cast-iron columns and lattice girders for guide-framing.

The actual sequence of events is very uncertain, as there was no actual eye-witness, and the accounts given by neighbouring residents and casual passers in the street are in some respects conflicting. But it would appear that at the time above named an immense volume of flame shot into the air from the new and larger holder, which rapidly settled down, and the steel tank split from top to bottom with such violence that it spread out to something approaching a half circle in section. The whole of the water rushed out with fearful rapidity, carrying everything before it. Coal-trucks on a siding that crossed the course followed by it were reduced to fragments, and heavy pipes, brickwork, &c., were carried great distances. A railway truck was thrown bodily into the backyards attached to a row of cottages, carrying with it a part of the boundary wall and entirely demolishing the outbuildings. Cellars in adjoining cottages were flooded, in one case with a fatal result.

The inhabitants in their abject alarm rushed to the cellar for security, only a moment before it was flooded; and one of them—a servant maid—failed to escape, and was drowned. It is most remarkable, considering the damage to cottage property, that the only other complaints of personal injury were of a trivial nature.

Fig. 1.—Remnants of the Collapsed Steel Wall of the Holder Tank, through the Breaking of which the Accident is Believed to have been Caused.

[The above photograph and those on pages 144 and 145 were taken by Mr. Samuel Kirk, of Nottingham.]

Fortunately the force of the current chiefly spent itself on the east side, away from the manufacturing and purifying plant.

The second holder above mentioned was seriously injured by heavy *débris*. A railway truck turned over with its wheels uppermost affords evidence of the violence of the outburst. The side of the second holder nearest the flood was completely crushed in like a piece of paper; and this holder at once settled irregularly, and the escaping gas was ignited. Some 500,000 cubic feet of gas escaped, and the blistered appearance of the ironwork, as also the blackened woodwork, shows that the whole vicinity was for a few minutes enveloped in flame. The governor-house was flooded to a depth of 4 feet; and the governor thrown out of action. But inspection showed that this important part of the plant had sustained no serious injury; and it was brought into operation on Friday.

For the present, the difficulty of maintaining the supply to the district is aggravated by the fact that only one small holder, of 100,000 cubic feet capacity, is available for use, and this is a narrow and lofty structure in three lifts. Beyond this the remainder of the plant escaped injury. An inspection of the site suggests that flood and not fire, was responsible for nearly all the damage done.

The sides of the tank, as before remarked, spread in each direction. The holder would appear to have fallen, not vertically, but at an angle of about 40° to the perpendicular, being carried forward 40 feet from its original position. In its flight, it covered the inlet valve; and Mr. F. C. Humphrys, on arrival at the gas-works, promptly crawled through a gap in the disabled holder and turned off the valve, thus stopping further escape of gas. On going inside the holder, it was seen that on the north there was only a few feet distance between the side and the centre pier. Apparently it canted somewhat in dropping, but settled down in an upright position. The outer lift is badly crushed towards the base. But the inner lift and the crown show little signs of injury; and it is singular that the holder itself is if anything less damaged than its neighbour.

Mr. J. Ferguson Bell, of Derby, and Mr. Samuel Glover, of St. Helens, have been called in by the Corporation to report as to the cause of the disaster; and it would be premature at present to follow this aspect of the matter further. The holder and tank have been in regular operation for two years and proved satisfactory. There has been no indication of defect or weakness, so the failure was entirely a surprise.

We need scarcely add that the occurrence is a severe trial to Mr. F. C. Humphrys, the Engineer and Manager, who for some time will have much difficulty in maintaining a proper supply of gas. He has received many visits and messages of condolence; and the Nottingham Gas Committee, whose mains approach one

Fig. 2.—Houses in Belfield Street immediately Contiguous to the Works, showing Damage caused by Smashing in of Roofs, upon which the Outer Steel Work of the Holder Fell.

extremity of the district, promptly offered to connect up and give a temporary supply.

[By a Local Press Correspondent.]

Ilkeston, which still ranks as one of the youngest among Derbyshire boroughs, has been the scene of many exciting occurrences in recent years; but nothing in its history has equalled the sensation attendent upon the incidents of Monday week, when, without a moment's presage, the town was startled by the blowing-up of the principal holder at the Corporation Gas-Works, followed by the partial demolition of a second large holder, occasioning widespread damage to the plant and surrounding property. In such a centre of mining enterprise, residents are not altogether unused to the reverberations inseparable from underground workings; but here was altogether a new experience. People in the neighbourhood concerned rushed from their houses panic stricken. The first thought—not unnaturally, in some quarters—was of a grave colliery disaster; and great was the relief to relatives of thousands of underground workers, when it was ascertained that the incident had its origin in an altogether different cause. Unfortunately, as it quickly transpired, the loss of one life—that of a young girl—had been involved; but this, again, was not so much due directly to the explosion itself, as to the panic which led the victim in blind haste to seek an altogether impossible refuge. No useful purpose would be served by speculating upon what might have happened in the way of loss of life or limb had the accident occurred at another period of the day, when more people might have been in the immediate vicinity. That there were grave potentialities upon such a score, is obvious. Fortunately, also, while the material damage has been extensive, the monetary loss to the ratepayers is likely to prove insignificant inasmuch as the insurance with the Royal Company has been upon an ample basis, covering not only the cost of the plant destroyed, but actually the gas which had been manufactured—a possibly unique arrangement in relation to an undertaking which, relatively, is not of large dimensions.

There were three gasholders at the works; the capacities being respectively 100,000, 250,000, and 470,000 cubic feet. The latter represented the latest addition to the undertaking—having been constructed about three-and-a-half years ago, by Messrs. C. & W. Walker, of Donnington, at a cost, including the tank, of £5400. It was from this, the largest holder, which had never suggested the slightest cause of suspicion, that the mischief originated. For over three years, the new holder had stood the full strain of interior and exterior conditions, proving impervious alike to the sun's rays and the winter's cold. Soon after 1.30 on Monday afternoon, however, the *débâcle* occurred. The suggestion is that a weakness in the wall of the tank then suddenly developed itself, letting loose the water in huge volumes, and that the gas thus released became ignited, by reason possibly of sparks from neighbouring buildings in Belfield Street—a strong wind at that moment blowing in the direction of the works. At the time the quantity of gas estimated as being contained in the principal holder was 320,000 cubic feet; there being in the second holder 160,000 feet. What happened may be almost as readily imagined as it can easily be described. The big holder was ripped to pieces, and the *débris* hurled yards away. Between it and the second holder there were four empty waggons standing in the yard sidings; and one of these, being lifted bodily up, cannoned on to the second holder, which was knocked askew, and then gradually settled down. Happily the third, and oldest, holder, escaped, and remains the sole resource until the process of reconstruction, which must necessarily occupy a considerable period, can be completed. The fortunate circumstance in the case is that the retort-houses, which are of comparatively recent construction, have escaped uninjured.

Fig. 3.—Bedroom Window from which a Man Jumped to Save his Life.

Curiously enough, in relation to the whole of the occurrence the damage actually from fire was infinitesimal. Beyond the scorching of the outer surface of the coal-waggon which was dashed against the second holder, and some scorching extending half-way round the latter structure, there is little to be seen in this connection. There is also considerable evidence of scorching on the wreck of the larger holder and tank. Water caused infinitely the greater damage—leading in the one case mentioned to the deplorably fatal result. The tank in which the chief, and now utterly demolished, holder worked had a capacity of 7600 tons of water. It was formed throughout of steel; being 115 feet in diameter by 26 feet deep. The two lifts of the holder, which was constructed on the spiral-guided system, measured respectively 108 feet and 110 ft. 6 in. diameter. Following the collapse of the tank-wall, the released water rushed into the neighbouring houses, and on to the Midland Railway, the branch line of which connecting the Junction with the Town Station is

Fig. 4.—Back of Houses in Rutland Street, with the Railway Waggon which was Washed or Hurled 40 Yards away from its Original Position.

[The house in the right-hand corner of the photograph is that in the cellar of which the servant girl, Matilda Gough, was drowned.]

in immediate proximity. The occupants of the houses in Belfield Street escaped, but not without great difficulty. When they succeeded in emerging, it was found that the water in the back yards reached as high as their waists. Some particularly meritorious work was effected by a cripple named George Lingard, who, despite his physical disability, succeeded in rescuing some women from a house, and dragging them to a place of safety. A general feeling has since found expression in favour of a public recognition of his services. By his timely intervention, he was no doubt instrumental in saving at least two lives. The sad fatality, which a little thoughtfulness might possibly have prevented, occurred on the premises of Mr. George Bostock, a grocer, &c. Following the detonations caused by the explosion, which, in their wild alarm, they seem to have mistaken for an earthquake, the occupants—including, in addition to Mr. Bostock and two children, a servant girl named Matilda Gough, aged 18—rushed into the cellar of the house for safety. When the water from the demolished tank began to pour into the house (which is situated in Rutland Street), the new element of danger was quickly realized; and, as promptly as the descent had been effected, the hurried egress from the cellar began. Mr. and Mrs. Bostock and the children managed to reach the ground floor in safety; but the onrush of water was for the time so great that it swept the girl back into the cellar. When the body was recovered a quarter-of-an-hour later, the usual means of endeavouring to restore respiration were resorted to; but the girl

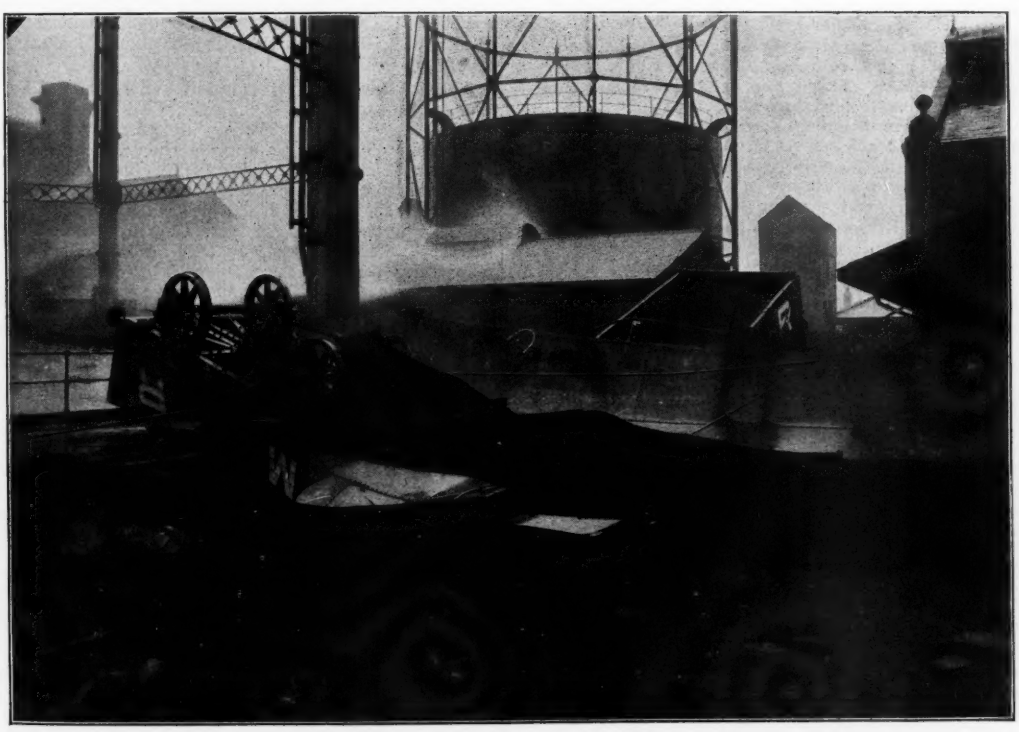


Fig. 5.—The Second Holder (against which the Coal-Truck shown in the Picture was Thrown), the Site of the Demolished Holder, and the Third Holder, now Intact.

was past all aid. A part of the outer steel wall of the holder alighted on some houses in Belfield Road, smashing in the roofs and doing other damage. The rush of water was over in about five minutes; but such was the volume discharged from the tank that the neighbouring Erewash Canal overflowed its banks.

Of the men engaged upon the gas-works, several stood in imminent danger of being submerged. Before they could escape, the torrent threw many to the ground. An employee named Garner had an exciting struggle. He was in a coal-shed with two other men, when, as he relates, he heard a sort of hissing noise. Before they knew where they were, the water rushed through the doorway of the shed, and swept their legs from under them. For several minutes they were struggling in the water, which they estimated must at one time have been six feet high at this point. The men managed to reach a ladder; but it slipped, and they were again thrown back, ultimately securing a position of safety by clambering on to a coal-heap, where they rested till the water had subsided.

Meanwhile, the full force of the temporary torrent was being experienced also in connection with the adjacent Midland lines. It fortunately happened that the Stationmaster at Ilkeston Town was at the Junction Station at the time; and seeing what had occurred, he stopped a train which was about to proceed to the Town Station. Traffic from the Junction had for a long time to be suspended. There were five waggons in the gas-works sidings waiting to be loaded with coke; and of these four were completely demolished, another being swept over 40 yards into the back of the neighbouring houses. The signalman on duty in the box near the Town Station described the gasholder as seeming to "swerve in," after which the rush of water began. He made his way down the line, and was instrumental in warning some girls of the impending danger from the water, which found a ready inlet to the canal. Nothing remains of the new holder but a twisted and tangled mass of *débris;* while the repairs to the second holder will necessarily entail much labour and cost. Steps have since been taken to clear the second holder of water; and it is hoped that this may be again rendered fit for use at an early date.

Mr. F. C. Humphrys, the Resident Gas Engineer, to whose judicious management, extending over a period of 37 years, the commercial success of the works has been mainly due, has dealt with the difficulties of the situation with characteristic resourcefulness, having the advantage of the temporary help of his son, who is engaged at one of the principal local collieries. Very wisely, also, expert aid from two important centres was speedily requisitioned, to assist in completing the work of examination and advising upon the steps to be taken—Mr. J. Ferguson Bell being called in from Derby, and Mr. S. Glover from St. Helens. It was at first regarded locally as being not improbable that the Home Office authorities might institute an official inquiry into the cause of the explosion. An official representing the Department was upon the scene early in the morning following the explosion; and the Town Clerk of Ilkeston was in London on Wednesday, in consultation with certain of the Government officials, with the result, it was understood, that all the information needed—at any rate, for immediate purposes—had been supplied. Whatever the ultimate solution may be as to the origin of the mischief leading to the explosion, there is evidently yet much needed in the way of expert examination. If the bursting of the tank wall was, as suggested, the cause of the accident, the question obviously arises as to how far previous and periodic examinations had gone in the direction of detecting the weakness. That it was a defect as sudden in its development as disastrous in its consequence, seems difficult to understand. It must be remembered that Ilkeston is honeycombed by colliery workings—resulting, as in other mining centres, in frequent and unforeseen surface subsidences; and it may be pointed out that a sharp frost prevailed previous to the accident.

The previous immunity of the works from serious accident, and the admirable financial results which have attended the undertaking for many years, testify to excellent management extending over a long period. When Mr. Humphrys (who was formerly at Barnet) took over the management, the works, like the town itself, were of very modest proportions. But Ilkeston, with its lace and hosiery industries, and the annually increasing exploitation of mineral wealth which is to be seen in all parts of the district, has grown during the last thirty years from a comparatively small township into quite an important centre; and the extension of the gas undertaking has naturally followed. The works, started some sixty years ago by a private Company, were purchased in 1879 by the Local Board, which had the administrative control of affairs prior to Ilkeston's incorporation in 1887 as a borough. The amount which has up to date been paid out of the profits in relief of the district rate totals £20,105, of which £1500 was contributed last year. But this has not been effected at the sacrifice of the interests of the consumers; for, whereas in 1879 the price charged was 4s. 2d. per 1000 cubic feet, last year it was 2s. 3d. only for illuminating purposes—1s. 6d. being charged for power.

Opening of the Inquest on the Unfortunate Girl.

The inquest on the body of the young girl, Deborah Matilda Gough, who was drowned in the cellar of the shop in Rutland Street, contiguous to the works, was opened on the day following the explosion, by Mr. W. H. Whiston, Coroner for the Derby district.

The inquest was adjourned until the 23rd inst., after evidence of identification had been given by the mother of the deceased, wife of Robert Gough, a boiler-maker, of No. 25, Awsworth Road. The preliminary inquiry was attended by Mr. C. R. Pendock, H.M. Inspector of Factories; the Town Clerk, Mr. S. F. James; the Gas Manager, Mr. F. C. Humphrys; Mr. S. Glover, Gas Engineer at St. Helens; and Mr. J. Ferguson Bell, Gas Engineer at Derby.

The Coroner, in opening the proceedings, referred to the feeling of thankfulness existing (which later investigation of the circumstances has abundantly amplified) that there were not more casualties in connection with the explosion.

A Juror voiced the general feeling of regret at the occurrence, and the hope that everything that was possible would be done for the sufferers in the disaster.

The Town Clerk expressed the regret of the Corporation at the unfortunate disaster, which, so far as they had been able to ascertain up to that time, was altogether inexplicable. In addition to this very sad loss of life, considerable damage had been done to property. On behalf of the Corporation, he expressed their great desire to help the Coroner in all ways possible, and also to assist any of the sufferers.

Reinforced Concrete Wharves and Warehouses.

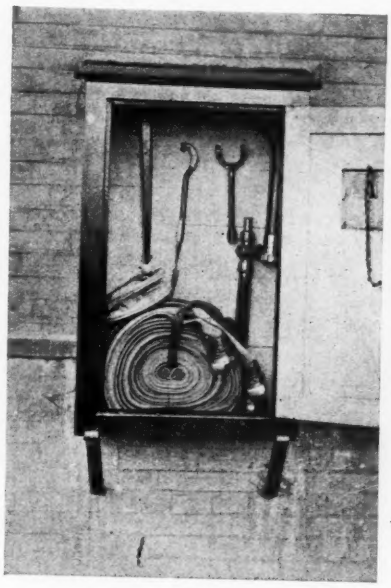
At the meeting of the Institution of Civil Engineers last Tuesday, Mr. S. H. Ellis read a paper in which he described some works in reinforced concrete recently constructed under his supervision beside the Whang-Poo River, near Shanghai. They comprise a piled wharf, 1160 feet long and 174 feet wide, with a minimum depth of 21 feet of water at its face; a quay wall, 495 feet long and 21 feet high; and two four-storey warehouses, each 300 feet by 100 feet in floor area; as well as offices and staff quarters, sheds for the temporary storage of goods, and a power and light installation. The question of foundations was dealt with by the author at some length; the site consisting of river-deposited silt to an unexplored depth. The wharves and lighter buildings are founded on groups of reinforced concrete piles. The warehouses rest on a raft of reinforced concrete (girders, beams, and foundation slab), connecting the column bases with a grill 4 ft. 6 in. to 5 feet deep. A brief account was given of the methods employed in driving the wharf piles, of which more than 4000 were used, and in the formation of the superstructure. The chief feature of the latter is that all members but the pile-caps, beams, and deck, were moulded on shore, and erected in place when matured. The nature and method of preparing the concrete were described; and the unit costs of the main items of the work were given.

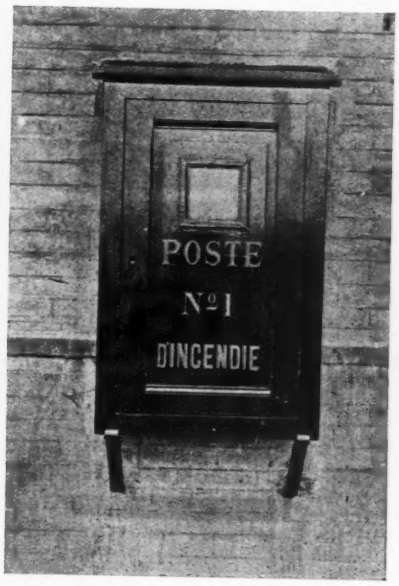
Masonic.—One of the few remaining duties of the year of office of the W.M. of the Evening Star Lodge (Bro. Cyril G. Davis) was efficiently discharged last Thursday, when he presided at the dinner and after-proceedings at the "Ladies' Night," which has now become an annual institution. About 180 members of the lodge and friends—both ladies and gentlemen—were received at the Connaught Rooms by the W.M., who was accompanied (in his sister's absence) by Mrs. Thomas Glover. After dinner, a few brief speeches were made and responded to; and then a musical programme of a very effective character was gone through. For much of the success of the gathering, credit must be given to Bro. Rae P. Normand, who, as Secretary of the Committee who had charge of the function, proved himself again this year (as last) an admirable organizer.—At the last monthly meeting of the Loyd Lindsay Lodge, a presentation was made to the Secretary (W. Bro. Gordon Walker, of Wantage) of a handsome gold watch, "as a mark of appreciation of seven years' invaluable services as Secretary of the Lodge."

Determination of Methane in Producer Gas and Enriched Water Gas.—In an article in the "Metallurgical and Chemical Engineer," Mr. S. H. Worrell describes a simple method for determining the methane in producer gas and enriched water gas. According to an abstract in the "Journal of the Society of Chemical Industry," the measuring burette used is calibrated over its entire length, is water-jacketed, and provided with a three-way tap, to one limb of which a pipette containing potassium hydroxide solution is permanently attached, while another limb is joined to the various absorption vessels in succession. The absorption of the several constituents is effected in the following order: Carbon dioxide by potassium hydroxide; illuminants by bromine solution followed by potassium hydroxide; oxygen by phosphorus; carbon monoxide by cuprous chloride in acid solution, using a double pipette and agitating the liquid in contact with the gas; followed by potassium hydroxide to remove acid vapours. Hydrogen and any carbon monoxide which has escaped absorption are oxidized by several passages over palladium oxide heated to between 90° C. and 100° C. The contraction and the subsequent contraction in contact with potassium hydroxide give the hydrogen and the carbon dioxide produced from the carbon monoxide respectively, which latter is added to that already found. In the gas consisting of methane and nitrogen which now remains, the methane is determined by combustion with heated copper oxide. For this purpose a narrow piece of combustion tubing, packed with fine copper oxide from which the actual dust has been removed, is used. The oxide is kept in position by plugs of asbestos; the ends of the tube being packed with glass wool to diminish the air space, the total of which in the tube need not exceed 1 c.c. It is determined by measuring the water required to fill it; a subsequent correction being made. If all the hydrogen had been removed in the last operation, there should be no direct contraction; the methane being represented by the contraction produced by the absorption of carbon dioxide that occurred in the potassium hydroxide pipette.

FIRE-EXTINGUISHING EQUIPMENT AT THE GENNEVILLIERS (PARIS) GAS-WORKS.

On the occasion of the annual congress of the Société Technique du Gaz en France held in Paris in 1910, a visit was paid to the works of the Société d'Eclairage, Chauffage, et Force Motrice at Gennevilliers, just outside the city. In the course of the illustrated particulars of the works which were given in the "Journal" at the time, it was mentioned that the Company have an excellent fire brigade; and on the occasion of the visit just referred to, the members of the Society were afforded an opportunity of witnessing their capabilities. The turn-out was remarkably smart; and the subsequent display evoked hearty applause. Similar expressions of approval were manifested on a subsequent occasion, and by visitors who probably were far more competent judges than a body of men who were more concerned in keeping fire in than in putting it out. Indeed, at the time of the disastrous floods in the neighbourhood of Paris, early in 1910, the





Figs. 1 and 2.—Hose-Box Open and Closed (Box Painted Red).

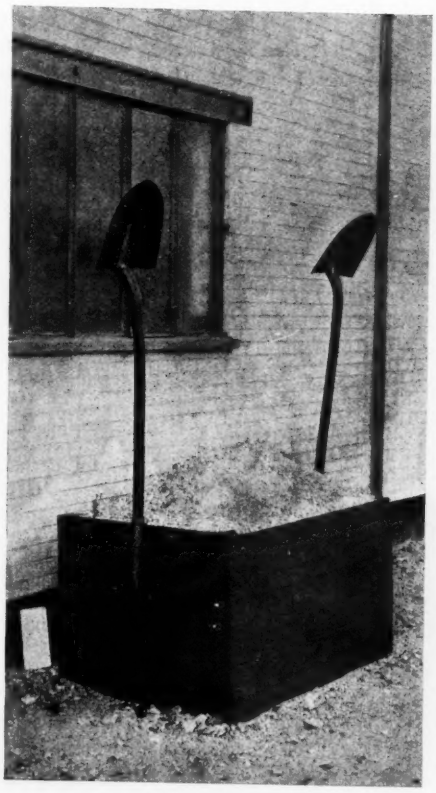


Fig. 3.—Sand Heap with Scoops (Box and Scoops Painted Red).

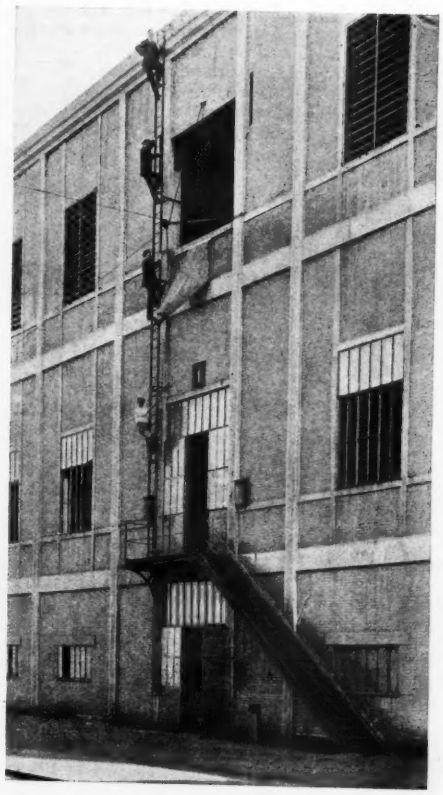


Fig. 4.—Fixed Escape Ladder (Painted Red).

engineering staff at the works were at their wits' end as to how to keep the fires going with the works several feet under water, and the various portions being reached in boats. To return, however, to the "more competent judges" just referred to, it may be explained that in August last, on the occasion of the visit to Paris of the Special Commission formed by the British Fire Prevention Committee, of which Mr. Edwin O. Sachs, who has made a special study of fire prevention, especially in theatres, is the Chairman, they inspected the equipment at Gennevilliers under the guidance of the Prefect of Police (M. Lépine). The Commission consisted of Mr. Sachs, Chairman, Mr. Ellis Marsland, the General Hon. Secretary of the Committee, who filled a like position (with the addition of the honorary treasurership) on the Commission, Mr. Horace S. Folker, the Hon. Treasurer of the Committee, and the Right Hon. the Earl of Londesborough, K.C.V.O., Mr. J. Herbert Dyer, Mr. E. Boyce-Podmore, and Lieut. Spencer, R.N., members

of the Fire Prevention Committee. The record of the visit, consisting of a diary and notes compiled by Mr. Sachs and Mr. Marsland, from memoranda prepared by the members of the Commission and from official data placed at their disposal by the French fire authorities, has lately been published, as a special issue of the "Journal" of the Committee, at their offices, No. 8, Waterloo Place, Pall Mall, at the price of 7s. 6d. It is a most interesting production, exceedingly well got up—the text being accompanied by 135 illustrations. We have received permission to extract from it a portion of the description of the Gennevilliers equipment; and, in addition, the blocks to illustrate it have been courteously placed at our disposal by the Committee.

The section of the record relating to Gennevilliers opens with the explanation that the fire brigade is a private one belonging to a large gas-works just outside Paris, where about 1100 men are employed, and from which gas is supplied to the whole of the suburban Outer Ring of the city. A description of the works follows; and it is explained that there is produced in them a considerable quantity of highly inflammable bye-products, such as creosote, heavy oils, &c. The more bulky of these are stored in large reinforced concrete tanks, each capable of holding 500 tons. These tanks are supported by reinforced concrete uprights, and are so arranged that a large dug-out pit is situated underneath the tanks. In the event of any one or all four tanks breaking or collapsing, the contents of the tanks would be held in the pit, and not overflow the works. As a matter of fact, at the time of the visit these reinforced concrete tanks all showed leakage; the heavy oils seeming to penetrate through the reinforced concrete, through the visible hair cracks. The result of this was that highly inflammable vapour was to be encountered in the neighbourhood of the tanks, which made it dangerous to pass them, even if only smoking, but much more dangerous if carrying any open light. Prohibition notices were conspicuously displayed; but there was still the risk.

The following are some of the principal fire-preventive measures at the works: All buildings are well and substantially constructed, and the majority are of reinforced concrete, well designed and carefully executed. Every building, no matter what its character, has staircases at either end. All buildings in which work of a dangerous character is done have additional iron cat ladders for exit through windows. [See fig. 4.] Smoking is practically forbidden in every building, and in large sections of the grounds. Rules are in force for the reduction of risks in sparks, from the appliances, locomotives, and open fires generally. Strict rules are issued as to storage of rubbish, cleanliness, and the blocking of exits. There are fourteen watchmen, who make rounds day and night; the rounds being in five sections. These men are not intended to act as firemen in the case of fire, but rather as watchmen, or private police, with a view of keeping the ground clear, guarding the entrances to the works, and the like.

The fire service comprises the private brigade, a number of auxiliaries (such as a float service, a lorry service, &c.), and a number of "duties" on the part of the officials and staff; the whole service being thought-out in considerable detail. The following are the principal features.

The brigade consists of 45 firemen, all workmen, in charge of a Superintendent who was formerly a sergeant in the Paris Fire Brigade. His staff includes two sub-officers, four deputy sub-officers, and two "corporals." The Superintendent is responsible to the Works Manager, who is the Honorary Commandant of the force, and has a Works Engineer as Deputy Commandant. There are always about 15 firemen on the premises. There are two fire stations, the appliances consisting of a petrol motor pump, steam motor pump, hose carts, hose reels, and ladder trucks, also smoke helmets, worked from hand pumps. All hose, couplings, hook ladders, &c., are of the same pattern as those of the Paris Fire Brigade and the Seine district brigades. There are also a float and some motor lorries at the disposal of the brigade, and they are manned by auxiliary crews. Besides protecting the gas-works, the brigade also attends fires in the surrounding country, assisting the official fire brigades of the communes or acting independently, as the case may be.

Referring to the *personnel* of the brigade, the compilers of the record explain that, before being allowed to join, the candidate must have passed his eighteenth, but not have exceeded his thirty-fifth year, and he must stand 5 ft. 3 in. high in his stockings. He must have been employed at the works for a year, have received a good character from his foreman, have shown that he is smart, have passed a special medical examination as well as one in gymnastics, and prove to the satisfaction of the Superintendent that he is steady and not giddy when mounting ladders, walking parapets, &c. It is stated that the relation of the men to their employers is generally very cordial; an excellent spirit of *camaraderie* prevailing, "while in no way discounting the obvious discipline, or lessening the respect of the worker to the Engineers or Directors." The rules of the brigade are particularly well conceived, and are worked out in considerable detail. The men are trained regularly —drilling not less than two hours per week; and there are monthly problem "manœuvres." Besides actual drill, the men all receive sectional instruction in regard to their appliances, the theory of fighting fires, inspection of buildings, and the use of the telephone. Every fireman must be able to work each appliance belonging to the brigade, including the motor pump and the steam motor fire-engine. The foremen in each building are responsible for clearing it of workmen who are not actually combating the fire; and they are further responsible for seeing that all offices, rooms, &c., have been searched, so that no man is overlooked. In various parts of the works there are prominent red boxes for hose; also large heaps of sand with scoops painted red. [See figs. 1 to 3.] All the external escape cat ladders are painted red.

The following are some notes regarding the fire equipment of the brigade: The motor pump consists of a second-hand petrol chassis of 35 to 40 H.P., fitted with a single rotary "Pellet" pump driven at a quarter of the speed of the engine, with a capacity of 220 gallons per minute at a pressure of 85 lbs. per square inch, with two deliveries of hose—1312 feet being carried. The steam motor fire-engine has a capacity of 440 gallons per minute, and carries 437 yards of 3-inch hose. The brigade has 2753 yards of hose, of which 1136 yards is 3-inch. There is on the premises a fire-main, into which water is pumped from two separate stations drawing from the Seine or from wells at the rate of 476 gallons per minute at a pressure of 70 to 100 lbs. per square inch. One pump is always going at a pressure of 28 lbs. per square inch; and the other is started on an alarm of fire being given. There are 68 external hydrants and five wells. The gas-works are on the banks of the river, and the Company own a small steam-tug for moving barges. This serves as a fire-float, having been fitted with a fire-pump, which can deliver 154 gallons per minute at a pressure of 85 lbs. per square inch. The staff of the float includes a diver, who has a full set of modern diving gear, and is also conversant with the use of smoke helmets.

On the occasion of the inspection, the men gave a well-arranged display, preceded by a turn-out of the petrol motor pump and two lorries. Details of this display are given, and illustrated in the book by eight views.

In their concluding remarks, the compilers of the record say the brigade is generally well organized, and its duties well considered. It fulfils its purpose admirably for its present strength and equipment; but it might well be of greater power, having special regard to the difficulty of obtaining effective outside help. For the all-important first 45 to 60 minutes of a fire, the works have only their own brigade to rely upon. The owners of the works are credited with having shown great wisdom in providing such a well-organized and efficient fire-service; but the opinion is expressed that it certainly requires further development to meet the risk at stake. Should the works ever be increased in size, the fire-preventive measures generally would, it is said, require more than a proportionate strengthening, as with larger works the fire risk is not merely proportionately but increasingly greater.

MANCHESTER UNIVERSITY LECTURES.

Professor Rutherford on Radio-Activity.

The third of the course of these lectures for the present session was delivered at the University on Saturday afternoon by Professor E. RUTHERFORD, D.Sc., Ph.D., F.R.S., who took for his subject "Radio-Activity." There was a smaller attendance than usual. Mr. A. L. HOLTON, President of the Manchester and District Junior Gas Association, occupied the chair; and letters of apology for inability to be present had been received from Mr. R. Watson, of Doncaster, President, and Mr. W. Whatmough, of Heywood, the Hon. Secretary, of the Manchester District Institution of Gas Engineers.

Professor RUTHERFORD admitted at the outset that his subject was one which possibly did not appeal very strongly to people engaged in gas engineering; but he was able to show, as he said, that it had great interest of its own, quite apart from any practical application to lighting, heating, or power. The lecturer explained at some length the origin of what is called the "Radium family;" the extraordinary activities of the rays emanating from radium; and the chemical changes that are set up. With a £600 tube of radium, he carried out a number of interesting experiments illustrating the points in his address; he also showed, by means of zinc sulphide plates, the wonderful phosphorescence effects obtained from the rays given off.

Mr. D. V. HOLLINGWORTH (Salford) in moving a vote of thanks to the lecturer, referred to the high position Professor Rutherford had attained in physical science, and thought the members of the Association were particularly honoured in having him to address them. He (Mr. Hollingworth) considered Professor Rutherford's book as being the standard work on the subject of radio-activity, and said the Manchester University ought to be proud to have attached to the staff a gentleman who might be looked upon as one of the highest British exponents of this branch of physical chemistry. As an instance of the indebtedness of science to Professor Rutherford, the speaker mentioned that he had accomplished the astonishing feat of tracing the ionization produced by a single A-ray particle—that was to say, a single helium atom which they had been told that afternoon travelled at the rate of 10,000 miles per second for only about 2 inches.

Mr. C. E. WOODHEAD (Manchester) seconded the motion; and it was carried by acclamation.

Professor RUTHERFORD briefly acknowledged the compliment.

After the lecture, there was an adjournment for tea; and on subsequently re-assembling in the Schunck Library of the University, Mr. C. H. Foden, of Manchester, read a paper entitled "Gas-Works Accountancy." The paper, with a report of the short discussion that followed, will be found on p. 154.

GAS-FIRE CONSTRUCTION.

[Second Article.]

By H. James Yates, F.C.S., M.I.Mech.E.

The present article is in continuation of a recent article by the writer in the "Journal" for Oct. 24 last, p. 241, discussing some points of gas-fire design and construction, particularly with reference to the burner. It is now proposed to deal with the brick and radiants. In so doing, it will not be necessary to go back to the old high-temperature convection fires; the scope of this article being confined to the modern shallow fire.

Functions of the Brick.

The functions of the brick, as it is now employed, are several. It acts as a protector. It also prevents the flame from impinging directly on the metal casing of the fire, and thus giving rise to high-temperature convection. At the same time, it prevents any more than a definitely limited quantity of air from having access to the back of the radiants. The former of these two effects need not be enlarged upon; the latter must be explained in some little detail. The flames of a bunsen burner, as adjusted for a fire, require, of course, a considerable secondary air supply to complete the combustion of the gas, in addition to the primary supply through the burner itself. Unless this air is supplied all round the flames, they will leave the inside of the radiants in quest of more air, and tend to "float." The portion which thus burns outside the radiants does nothing to increase the incandescence of the fire, and a lowered efficiency is the result. At the same time, the incomplete combustion inside the radiants causes deposition of carbon there, to say nothing of probable production of carbon monoxide. As a gas-fire can usually obtain sufficient air for the front of the flames, it becomes a question of such construction as will supply the requisite amount of air to the back; and it is evident that a flat brick fitting close up to the radiants will have a detrimental effect on the combustion, and radiants with solid backs produce in full the effects described above—the "floating" of the flame, the consequent lowered efficiency, and the deposition of carbon. This has been recognized to some extent by most stove makers; and not only do practically all gas-fires this season have bricks provided with either grooves or studs, but solid-backed radiants (with whatever sanguine hopes they may have been introduced) have, as I expected, had to be abandoned in the latest fires. If more than the proper amount of air be allowed access to the back of the radiants, excessive cooling ensues and radiant efficiency is lowered, though this can be to some extent hindered by the design and placing of the projections on the brick.

It Acts as a Reservoir of Heat.

The recent general tendency has been to lighten the radiants very considerably; and it is a great advantage to the industry that these lines have been followed. When the idea of lightened and open-fronted radiants first occurred to me, I satisfied myself that it was warranted on theoretical grounds; but it was only after I had convinced myself by exhaustive radiometer tests that the innovation was amply justified by increased radiation that I introduced it. Radiation from fuel may be said to follow approximately the Stefan-Bolzmann law—that is, it is proportional to the fourth power of the absolute temperature. The lighter the radiants, the higher and quicker the temperature to which they can be raised. The drawback is, of course, that the radiants being thus made hotter, the products of combustion leave them at a higher temperature. To correct this, much can be done by a properly-designed brick. Combustion must be made to take place in as limited a space as possible, thus attaining concentration of heat, higher temperature, and increased radiation, while the flames are caused to expend as much of the heat as is not directly utilized by the radiants on the brick, which thus acts as a reservoir of heat, and keeps the radiants themselves from too rapid cooling.

From these considerations, it will be seen that too large a radiant area is a serious mistake; for either the lower part of the radiants will be heated to a high temperature and the upper part be dull, which, besides being a waste of material, gives the fire an unequally heated appearance, or if the whole of the radiants be heated equally, the average temperature will be a low one, and the fire cannot, therefore, give a good radiant efficiency. There is only one way of economically justifying the use of very long radiants—that is, by burning a large amount of gas. This, however, presents difficulties with the aëration of the burner, and still demands the same attention to design in the brick. In fact, the object aimed at—viz., increase in the amount of radiation—can be satisfactorily attained only by widening the radiant area and not by lengthening it. This I have definitely established, both by my own experiments and by testing such appliances as are made with the very long radiants. It must be emphasized here that radiation is not an elusive intangible thing, but represents a definite number of heat units; and if the amount of radiation is to be increased, then an increased quantity of heat units must be supplied to the fire by increasing the quantity of gas; otherwise there cannot be an increase in the amount of radiation.

It must be made clear that in this reference to radiation, I am not alluding to increased percentage of radiation, but to an increased amount of radiation through the addition of a definite quantity of heat units in the form of additional gas. I am assuming that the maximum possible percentage of radiation is being obtained; and speaking of a maximum in this connection, it is well to remind ourselves that, owing to conditions inevitably attaching to the working of gas-fires, science declares that something in the region of 50 per cent. is the highest percentage of the heat units obtainable as radiation.

Points Requiring Explanation.

While fulfilling the above functions satisfactorily, it ought not to hinder (but to assist) the escape of the products of combustion up the flue. In this connection, there are several points—some of them not superficially apparent—which require explanation. The first point to establish is that the area of the flue outlet must be sufficient to remove the products of combustion, which are at a much increased volume owing to their temperature—being doubled in volume at about 580° Fahr. At the same time, if a gas-fire is to satisfactorily take the place of a coal-fire, it must not only get rid of the products of combustion up the flue, but it must adequately ventilate the room. It is useless to provide a small flue only, and expect it to do the work. I have found by experiment that for a 10-inch fire, a flue outlet of a minimum area of at least 7 square inches is essential; and it is much to be desired that all makes of gas-fires should have flue outlets not smaller than this minimum. The shape of the outlet is also of great importance. It is obvious that a round flue outlet tends to draw the gases mainly from the centre of the canopy; the sides of the canopy, the very parts where there is most likely to be an escape, being comparatively without "pull." The remedy for this is a flattened flue outlet extending the width of the fire if possible, and of an area not less than that mentioned; and I am glad to see prospects of this being generally adopted. This distributes the "pull" over the whole width of the canopy. Of course, it is useless to make provision of this sort unless the canopy is, in the first place, of proper shape and projects far enough (which can only be ascertained by analyzing the air over the canopy for traces of products of combustion); and, in the second place, unless the canopy be kept free from all obstructions. I have seen canopies fitted with bricks, or other obstructions, intended to hold the radiants in position; and, as was to be expected, analysis of the air over the canopy shows a large escape of products of combustion.

A point needing strict attention is the proper amount of projection of the canopy in front of a perpendicular drawn through the centre of the burner teats. If this be insufficient, escape into the room is bound to follow. Escape is also assisted by having radiants with dense backs so arranged close up to the brick that flame or waste products cannot go backwards through the radiants and travel up the surface of the brick to the flue, but must come out through the front of the radiants. It is perhaps necessary to point out that in radiants designed for use each with a single flame, unless they are so wide as to be useless, the cross sectional area cannot be great enough to contain the products of combustion and not allow any to escape, especially if such radiants are shaped to fit the flame as it tapers towards the top. As a consequence, either the products of combustion will go to the back—if there be room—or they must come out in front, which latter unfortunate result is also assisted by the radiants sloping backward as they do in some fires. On the further necessity for avoiding backward sloping radiants, owing to their throwing out radiant heat towards the ceiling where it is not needed, it is unnecessary to enlarge.

One other point of paramount importance requires attention. Following the above argument proving the necessity of a large flue outlet, it will be recognized that to get rid of the products of combustion, and at the same time ventilate the room, a considerable volume of air must be drawn through the flue. Where the flue outfit is so arranged that it draws this air directly over the fire-front and through the radiants, it is evident that a very serious cooling action is exerted on the radiants, and a corresponding loss of radiant efficiency results. An awkward dilemma is thus created. If such a fire is to give high radiant efficiency, it must allow a large escape of products of combustion into the room. If, on the other hand, means be taken to prevent such escape, then the fire will be cooled and its radiant efficiency lowered. In order to escape from this dilemma, it is necessary to avoid such a construction of fire. The radiants must not be prolonged upwards into the canopy; and a most essential point is that an adequate distance be maintained between the lower edge of the canopy and the top of the radiants—the brick being made to rise a sufficient distance above the top of the radiants. In a fire so constructed, the cooling referred to is avoided by protecting the radiants from direct draught. An invaluable assistance to this object is to have a rounded forward projection or hump at the top of the brick. The brick preferably slopes gradually up to this projection and guides the products of combustion up to the point where the full force of the draught sucks them at once bodily into the flue. This plan is very effective, both as regards protecting the radiants from cold air and getting entirely rid of the products of combustion, and is similar to that adopted in all modern coal-fire grates.

It only remains to emphasize the fact that such points as have been above laid down are no pious opinions of the writer, but are definitive facts established and demonstrated at every stage by actual systematic testing and analysis.

Mr. Peter Hurll, the well-known fire-clay manufacturer of Glasgow, whose death was recorded in the "Journal" for the 22nd of August last, left estate of the gross value of £31,201.

THE COMPARATIVE MERITS OF BRONZE AND NICKEL COINS FOR COIN-FREED MACHINES.

By W. J. A. Butterfield, M.A., Assoc.Inst.C.E.

Some observations in the Engineering Notes in the "Daily Telegraph" recently, in which the nickel coins of some continental countries were stated to be superior in several respects to the British bronze coins of corresponding value, reminded the writer of this article of an aspect of the question which had not been considered in those observations, but which is of very great moment at the present day.

One of the most important uses of the penny piece and its foreign equivalents is for "penny-in-the-slot" or "automatic" machines; and in urban districts, the prepayment gas-meter probably absorbs more such coins than all the rest of the automatic machines. The problem of the economical collection and re-distribution of the coins is one which presents considerable difficulties to the managements of the larger gas undertakings. A man's full load of penny pieces represents a comparatively small sum; and whatever arrangements may be made for facilitating the transport and disposal of the day's takings, it is evident that human and other energy must be expended thereon to an extent which is altogether disproportionate to the total currency value of the weight of coins handled. It must often have occurred to persons concerned in this branch of the gas business, or with any class of penny-in-the-slot machines, that a great reduction of expenses would be effected if our penny token were of much smaller weight than it is.

The nickel coins of corresponding value which are issued in many foreign countries in place of bronze coins would appear to be preferable in this respect to the bronze penny piece. But even with some of these nickel coins the difficulties referred to, though appreciably reduced, are still seriously felt by the prepayment meter department of a large gas undertaking. For instance, the writer recalls an account given by Herr Kobbert, the Manager of the Königsberg Gas-Works, of the pneumatic-tyred iron trolleys, capable of receiving the coin-boxes from 200 prepayment meters, and divided into compartments with spring lock fastenings, which are used by the collectors under his control. Clearly, therefore, the nickel 10-pfennig piece, which is the "penny" of Germany, is not so light that a prepayment meter collector can carry unaided the takings from his ordinary round. Yet it is much lighter than our bronze penny-piece.

The writer found by inquiry of a number of English technical men, who, in frequent journeyings on the Continent, had become quite familiar with the small nickel coins of Germany, Switzerland, and Austria, that they had nevertheless gained very erroneous impressions of the comparative weights of these coins and the English bronze penny. Since in any discussion, such as that in the "Daily Telegraph" to which reference has been made, of the propriety of superseding our bronze coins by nickel, the weight as well as the size of the coins must be considered, and since the question is one of great importance in relation to the use of prepayment gas-meters and coin-freed machines generally, the writer has thought that many technical men would be interested in a statement of the weights and sizes of the coins which are the foreign equivalents of the penny.

A ton of coin collected from such machines must entail certain charges for handling which are independent of the number or currency value of the coins or tokens contained in it, and hence, other things being equal, the token of about the currency value of one penny of which the greatest number are comprised in a weight of one ton should be preferred by gas undertakings and other large owners of coin-freed machines. He therefore has added in the accompanying table the approximate number of coins to the ton. He has not thought it necessary to include coins of a higher value than the practical equivalent in each country of the penny, though he is aware that in a few of the countries where the prices of commodities or the standards of living are widely different from those obtaining in England, coin-freed machines are more commonly adapted for the use of coins of lower or higher denomination than the penny. For the convenience of readers whose sphere of activities may lie in countries where the metric system of weights and measures is followed, he has included also the metric equivalents of the English figures.

Before passing on to the comparative statement, however, the writer would point out that both the weights and sizes of the English bronze coins bear very simple relations to the English standards of weight and measure. The average weight of the penny, as coined, is exactly one-third of an ounce avoirdupois, that of the half-penny exactly one-fifth of an ounce, and that of the farthing exactly one-tenth of an ounce. The penny is 1·22 inch in diameter, and the half-penny exactly one inch. In these respects, our bronze coins can be utilized as casual weights and measures equally as well as any of the continental coins, though a few of the latter have their standard weight stamped upon them. The obvious objection to the use of coins as weights is that they become light through wear; and consequently anyone whoever essayed to weigh for sale (say) ½ lb. of some small article of grocery, taking 24 penny-pieces which had been in regular circulation for a few years to serve as the ½ lb. weight, would certainly be giving light weight to the customer, though the deficiency would ordinarily not exceed ⅛ oz.

Pennies which, owing to wear, are 8 per cent. below the standard weight, are, however, fairly frequently found in circulation. There are therefore very real objections to the general use of coins as weights; and the practice of stamping their normal weight upon them is objectionable in that it tends to encourage the use of the coins as weights.

The more general use on the Continent of purses by men as well as women no doubt reduces the wear on coins; but the effect does not appear to be that the coins are withdrawn from circulation with a smaller loss of weight than here, but that the life of the coins is prolonged. The writer has added, in cases where he has several specimens of the same coin, the extreme limits of their weights; but naturally the range of variation would have been widened if a great number of coins had been weighed. In many instances he has found it difficult to ascertain the standard weight of the coin as minted, and in these cases he has inferred it from the weight and condition of the specimens in his possession. Any deductions which may be drawn from the figures given cannot be appreciably affected by any small discrepancy thus introduced in the standard weight column.

It will be seen from the table that the British penny has a higher currency value per ton weight than any of the other bronze coins referred to. Of the European nickels, the Austro-Hungarian has the highest currency value per ton (and that is 3·15 times as great as the British penny) and is followed in order by the Swiss, German, Belgian, Dutch, and Rumanian nickels. The last named has barely double the currency value per ton of the British penny. The 5 cents nickel of the United States cannot fairly be compared with the European coins named in the table, because of its higher value, though in practical dealings it may be regarded as the equivalent of the penny. The Scandinavian 10 öre piece is of silver of low fineness (its millesimal fineness is 400), and its weight is less than half that of any of the European nickels, while its currency value is rather higher. It would appear from the table to be the ideal coin for use in slot meters and similar machines;

Table *Showing the Relation of Weight to Currency Value of the Penny and its Foreign Equivalents.*

	Country.	Denomination.	Metal.	Value in Terms of the Penny at Current Rates of Exchange.	Diameter.		Standard Weight.		Extreme Weights Observed.		Approximate Number of Coins to the		Approximate Currency Value in Sterling of the Coins in One	
					Inches.	Millimetres.	Grains.	Grms.	Min. Grms.	Max. Grms.	Metric Tonne.	English Ton.	Metric Tonne.	English Ton.
	Britain	Penny	Bronze	1 000.	1·22	31	145·83	9·45	..	..	105,821	107,520	£441	£448
	Argentine Republic	2 Centavos	,,	0·95	1·19	30½	154·32	10·00	9·760	9·986	100,000	101,605	396	402
Latin Union	France	10 Centimes	,,	0 95	1·19	30½	154·32	10·00	9·202	10·040	100,000	101,605	396	402
Latin Union	Greece	10 Lepta	,,	0·95	1·19	30½	154·32	10·00	..	10·040	100,000	101,605	396	402
Latin Union	Italy	10 Centesimi	,,	0·95	1·19	30½	154 32	10·00	9·655	9·914	100,000	101,605	396	402
Latin Union	Spain	10 Centimos	,,	0·90	1·19	30½	154 32	10·00	9·882	..	100,000	101,605	375	381
Latin Union	Belgium	10 Centimes*	Nickel	0·95	0·87	22½	61·73	4·00	3·892	4·000	250,000	254,010	990	1005
Latin Union	Rumania	10 Bani	,,	0 95	0·87	22½	70·20	4 55	4·450	4·537	219,780	223,360	870	884
Latin Union	Switzerland	10 Rappen	,,	0·95	0·76	19½	46·30	3·00	2·900	3·065	333,334	338,680	1320	1341
	Austria	10 Heller	}											
	Hungary	10 Filler	}	1·00	0 75	19	46·30	3·00	2·962	3·038	333,334	338,680	1389	1411
	Germany	10 Pfennig	,,	1·17	0·83	21	61·73	4·00	3·485	4·030	250,000	254,010	1219	1238
	Holland	5 Cents	,,	1·00	0·72	18½	69·44	4·50	..	4 525	222,223	225,790	926	941
	Portugal	20 Reis	Bronze	0 98	1·19	30	185·20	12·00	11·660	12 045	83,334	84,665	340	346
	Russia	5 Kopecks	,,	1·27	1·28	32⅝	250·80	16·25	15·290	16·192	61,538	62,520	326	331
Scandinavian Union	Denmark	}												
Scandinavian Union	Norway	} 10 Öre	Silver	1·32	0·59	15	22·4	1 45	1·450	1·473	689,655	700,000	3793	3850
Scandinavian Union	Sweden	}												
	United States of America†	5 Cents	Nickel	2·46	0·84	21¼	78·0	5·05	4·748	5·043	197,849	201,025	2028	2060

* Perforated. † An older issue of the 5 cents piece, still in circulation, is about 0·81 inch in diameter, and weighs 79 grains.

but its small size and weight are greatly against it for general use. So far as distinctiveness from silver coins of higher value is concerned, the perforated Belgian 10 centime piece is the best of the nickel coins. There are said to be hygienic advantages in bronze, as compared with nickel and silver, as a metal for coinage, in that it is reputed to sterilize matter which clings to it, whereas the other metals do not.

If the question of the supersession of the British bronze penny by a nickel coin should come to the forefront in the course of a few years, there can be no doubt that the views of the administrators of gas undertakings, as the largest proprietors of penny-in-the-slot machines, will carry very great weight. The information collected in the accompanying table may prove useful then, or in preliminary discussions of the question at the present time.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

About fifty members of the London and Southern District Junior Gas Association took part in the carrying out of a lengthy programme which had been arranged for them last Saturday. They were amply rewarded; for a profitable time was spent—right away from half-past three, when they met in Westminster, until about ten o'clock, when they parted in the City.

The proceedings opened in the offices of the Gaslight and Coke Company, in Horseferry Road, where the members, after looking round the show-rooms, were entertained at tea in the officers' dining-room. Mr. F. W. Goodenough, the Controller of the Sales Department of the Company, who took the chair, in welcoming the members on behalf of the Company, remarked that the Directors were always interested, as he himself was, and all the other senior officers of the Company were, in the proceedings of the Junior Association. The Governor always looked with a very kindly eye on everything designed, as this Association was designed, to assist the juniors in the profession to improve their knowledge, and thereby their prospects in life. Continuing, Mr. Goodenough gave his hearers some food for reflection, by laying stress upon the desirability throughout life of cultivating the art of "seeing the other man's point of view." This, he said, was a matter which they, as young men, would find of very great importance, not only in business, but in life generally. It was necessary for them to understand their employer's point of view, if they were going to do the best work, because if they were going to perform what was required of them in the best possible way they must understand the reason why they were required to do it, and what it was their employer or senior officer really needed. They should always be looking at their work from their employer's point of view, as well as their own; and they should always regard any business in hand from the customer's point of view, as well as from their own. It was a great mistake in business matters to look at things only from their own point of view, and not to realize how the customer would regard the transaction that might be under negotiation. The same considerations applied to one's home life. Shortly, what he was advocating was the cultivation of unselfishness and consideration for other people; and this was profitable in business as well as in private life. In large undertakings especially, it was, of course, necessary for those engaged to bear in mind the point of view of other departments as well as their own particular one. In conclusion, he remarked that after tea the members would be visiting the compressing station, where Mr. Dodimead would explain everything to them; and then they would look at the apprentice shops, the features of which Mr. Smithers would point out. These apprentice shops were the special "child" of Mr. Corbet Woodall, who had devoted a very great amount of thought to them. What had been done in this connection showed the importance attached by the Governor to educational work from the very commencement, when boys were beginning the real education of life—that was to say, when they left school. He trusted the members would have a pleasant and instructive time; and he would ask his assistant, Mr. J. E. Henwood, to take the chair until the party left Horseferry Road.

A move was then made to the compressing station at the back of the Company's offices. The installation there consists of four Keith rotary compressors, gas-engine driven. Two of the compressors have a capacity of 20,000 cubic feet per hour each; and the others are smaller, of 10,000 and 5000 cubic feet per hour respectively. The gas is delivered at a pressure of 100 inches head of water, and is distributed through 4½ miles of 8-inch and 6-inch steel mains. About a mile of the main is in the County Council subways. The installation serves a number of high-pressure public lamps in the Westminster area, as well as the Victoria Station of the London, Brighton, and South Coast Railway, and some shop lighting. There was a quantity of photometrical apparatus in the compressor-house, for the inspection of the members, who afterwards spent some time in the workshops for the fitters' apprentices.

The party then returned to the offices, where an informal meeting was held, at which the President (Mr. J. G. Clark) opened a discussion on "The Nomenclature of Lighting." In this way, an hour and more was usefully spent. The discussion being an "informal" one, no report of it will be given. It may, however, be said that the President was followed with close attention by the members, and that he dealt with the subject before the meeting in a very lucid manner. Alluding to the different ideas attached to terms, he pointed out the importance of having a language consisting of terms which possessed definite meanings. Though photometry in the creative sense must be left to the expert, everybody interested in lighting should, he said, take an appreciative interest in it—that was to say, they should be in a position to assimilate the data put before them by the photometrist. For this purpose, they must understand the nomenclature of lighting. Mr. Clark then referred to a number of terms. As to the "candle," it had, he reminded the members, to be borne in mind that this was only a standard in one particular direction. Another important thing to remember—in connection with what might be called the "seeing power" of light—was that, if they went on increasing the amount of illumination in any particular place, there was a point to be reached where the increase in the light had no effect on the eye. Concluding a few remarks on diffusion, he drew attention to the superiority of gaslight in this respect, owing to the large area of the source of light. Among the points raised in the discussion were the meaning of the word "glare," the need when drawing up schemes of internal lighting of taking into consideration the different coloured decorations, and the sharp shadows thrown by powerful electric lights.

The President said that, before leaving Westminster, the members would wish to show their appreciation of what the Gaslight and Coke Company had done for them. They had entertained them at tea, granted them facilities for inspecting certain parts of the works, and placed at their disposal the room in which the meeting was being held. Mr. D. J. Winslow proposed a hearty vote of thanks to the Company, coupling with it the names of Mr. Goodenough and Mr. Henwood. He said they were all glad to see the immense strides the Company were making in the matter of high-pressure gas lighting. Mr. J. Hewett seconded the proposition, which was carried with applause. In response, Mr. Henwood assured the members that the Company were very pleased to have the opportunity of showing in a practical manner their interest and sympathy in the work of the Association. The Company had spared no efforts to make high-pressure lighting a success, not only for their own advantage, but for that of the gas industry generally.

The party then proceeded to the printing works in Salisbury Square of the United Newspapers, Limited ("Daily Chronicle" and "Lloyd's Weekly News"). Arriving at half-past eight, they had the good fortune to see everything in full swing. A start was made with the composing rooms, where the innumerable linotype machines (with their low-pressure gas supply for the melting of the metal) were subjected to close inspection. Then there was the stereotyping department, where high-pressure gas is employed for metal melting. Here the following processes were seen in operation: (1) Preparation of the flong or moulding material; (2) moulding from the forme; (3) casting plates in horizontal casting boxes; and (4) dressing and cooling the plates. After this came a visit to the machine room, where much admiration was bestowed upon the seven double octuple, or eight-roll, double-width presses, each of which is capable of printing up to sixteen pages at the rate of 100,000 copies per hour. Each press is equipped with two 75 H.P. electric motors, which may be run in parallel or separately. The visit was of quite a novel character for the Association; and, of course, its value was enhanced by the fact that it took place when all departments were in "full blast." Everything possible amid the stress of work was done to give the members an insight into the different operations involved in the preparation of the newspapers of to-day; and it is to be hoped that the presence of so large a party did not delay in any way the printing of Sunday's edition of "Lloyd's Weekly News."

"Transactions" of the North British Association.

We have received the report of proceedings at the fiftieth annual meeting of the North British Association of Gas Managers, held in Glasgow on the 7th and 8th of September last, under the presidency of Mr. George Keillor, of Broughty Ferry. The volume is of special interest, inasmuch as it contains not only a record of the technical business transacted at what was the Jubilee meeting of the Association, but also the very able appreciation of the late William Young, prepared by Dr. Alfred Daniell, F.R.S.E., at the request of the Memorial Committee, whose final report, the trust deed, and the list of subscribers to the fund, are included. The technical matter, which was given in the "JOURNAL" at the time of the meeting, is followed by lists of the officers and members, and the "Statistical Report of the Gas Supply of Scotland" for the year ended May 15, 1911, published by the Committee of the Association. In addition to the illustrations to the papers, the volume has some portraits. There is, of course, one of the President. Then we have a group of the originators of the Association—Mr. J. Lowden, of Leven, Mr. William Mackenzie, of Cupar, Mr. G. Myers, of Broughty Ferry, and Mr. Proctor, of Forfar. A portrait of Mr. Young faces the first page of the appreciation, and one of Dr. Daniell the last page. Portraits are also given of the readers of the papers (Messrs. W. Key and W. Blair), as well as of the opener of the discussion on "The Need of Publicity" (Mr. W. M. Mason), and of the gentleman who replied to him (Mr. J. Napier Myers). As usual, a photograph of the members, taken on the day of the excursion, forms a frontispiece. The book has been produced under the supervision of Mr. Lawrence Hislop, of Uddingston, the Secretary and Treasurer of the Association.

MEASUREMENT OF LIGHT AND ILLUMINATION.

The first six lectures of the course on "Illumination" arranged to be delivered at the Regent Street Polytechnic in the session 1911-12 were given before Christmas, when the advances in the chief modern methods of illumination and the effect of light on the eye were dealt with.

The opening lecture of the second half of the course, on "The Measurement of Light," was delivered by Mr. J. S. Dow on Thursday last. The lecturer commenced by referring to the great progress made in artificial illuminants, as illustrated by the previous lectures. He said that at the present time the difficulty of deciding the fields of action of the various illuminants showed the need for precise methods of photometric testing. People were no longer satisfied with details of the cost of maintenance, but also required figures for the actual light which a lamp produced.

Mr. Dow pointed out that the nature of radiation from various lamps is quite different. In some cases certain kinds of rays—such as the infra-red and the ultra-violet—are present in a much greater proportion than in others; and, in any case, it is only an exceedingly small section of the total range of radiation that is useful to the eye. For this reason one could not, in general, make use of photographic or other physical methods of measuring light, though there are certain cases in which such methods could be applied under certain restrictions. It is always necessary, however, to go back to photometry, and to measure the "power of creating brightness" of an illuminant. As an illustration, Mr. Dow showed a series of photographs of a set of test-types, illuminated to the same intensity by various kinds of lamps, and developed under identical conditions; the photographic action being much more marked in some cases than in others. He went on to say that it had also been proposed to test lamps by observing the distinctness of illuminated printed letters; and so-called "discrimination-photometers," based on this principle, had been devised. It was questionable, however, whether the power of creating brightness and the power of revealing the detail of an illuminant were not distinct functions; and these two tests should not be confused with one another. As would be seen later, this distinction was very clearly brought out in comparing monochromatic light from different parts of the spectrum.

The lecturer then gave an explanation of the law of inverse squares and the cosine law—pointing out the limitations of each. He showed how both these methods are utilized in the case of modern photometric instruments. Other means of adjusting the illumination on a photometer screen included the use of the rotating sector and adjustable diaphragms. The latter principle is employed in the Simmance-Abady street photometer (which was exhibited) and in the "Holophane" lumeter. Mr. Dow said dark glasses might also be employed; but their values had to be determined by making use of the law of inverse squares.

Mr. Dow then traced the progress made in the last few years in connection with standard lights; distinguishing between primary and secondary standards, and alluding to the great simplification obtained by the agreement to use a common unit in Great Britain, France, and the United States. He also explained the manner of interchanging calibrated incandescent electric glow lamps between the various laboratories in Europe. By this means, he said, the units in different countries were constantly checked. Subsequently a great variety of photometers—including the Joly block, grease-spot, Simmance-Abady flicker, Wild flicker, Everett-Edgcumbe flicker, Wild mirror, and other types—were shown and described. In this connection, the lecturer pointed out that the sensitiveness of photometric instruments had greatly developed in recent years, so that one now heard much less of the "personal error." This error was now considered only of very serious consequence when an attempt to compare lights of markedly different colour was made.

Turning to the question of the distribution of light from lamps, the lecturer showed several slides demonstrating how greatly lamps possessing the same nominal candle power differ in this respect. He said it was most essential, in order to describe a lamp completely, to give not only its candle power in one direction, or its mean spherical candle power, but also its polar curve of light distribution. He had noticed that some of the newer forms of gas-lamps appeared to differ considerably in this respect, owing, presumably, to slight modifications in the form of reflector. Some gave a much larger proportion of the light immediately below the lamp; while others threw out most of the light sideways. Naturally the user who did not recognize this fact was apt to be misled until the distinction was pointed out to him; and it was even more important to bear in mind the nature of the polar curve when comparing different illuminants.

Slides were next shown illustrating different methods of obtaining polar curves by rotating mirrors, &c.; and a method which the lecturer had recently devised in connection with Mr. Mackinney seemed very convenient and was apparently new. It consisted in the movement of a mat celluloid screen round the source at a constant distance away; its brightness (proportional to the candle power in the respective directions) being observed by an appropriate form of instrument such as the "Holophane" lumeter. It was explained that the polar curve could be traced out while the experiment was actually in progress; and it was also possible to correct for stray light, and so to use the apparatus (with care) in an ordinary room without blackened walls. Some other slides showed the use of the Ulbricht sphere, the Matthews integrating photometer, &c.

In conclusion, the lecturer referred to the steady progress now being made in photometry, which was, he said, coming to be looked upon as quite a feasible and comparatively simple process. In the present lecture, he had referred only to the measurement of light from the source. On the next occasion illumination photometry and daylight problems would be considered.

At the close of the lecture acknowledgment was made of the courtesy of the Central Technical College, the Birkbeck Institute, the Gaslight and Coke Company, the Westminster Electric Testing Laboratories, and Messrs. Everett, Edgcumbe, and Co., who had lent apparatus for exhibition.

ILLUMINATION AS A STUDY FOR ARCHITECTS.

At the Meeting of the Society of Architects last Thursday, Mr. JOHN DARCH, F.S.I., read a paper on the above subject, from which the following are extracts.

The governing factors of illumination may be classed under the following heads: (1) Physical; (2) Physiological; (3) Æsthetic; (4) Economic. We have to see what these factors demand, and what are the principles deducible therefrom.

The physics of light in its more modern form is built upon theories essentially different from those which held place in our younger days, and afford a much better explanation of the forces and phenomena involved in illumination. The ever-present difficulty in artificial lighting is the preponderating accompaniment of heat (or ultra-red) rays, and the activity of the actinic (or ultra-violet) rays. Both are invisible; but their power over the human economy for good or ill is nevertheless very real, while the luminous part of the spectrum of radiation for all illuminants is a very small one.

Dr. Drysdale, in a recent article, has given particulars of the enormous waste of energy—principally in heat—necessary for an exceedingly small percentage of light; and I have put them into the following table:—

Energy Expended in—	Percentage of Yield of Light (Approx.).
Candle	0·1
Oil-lamp	0·2
Gas-lamp	0·2
Incandescent gas	1·0
Carbon glow lamp	2·5*
Nernst	5·0*
Metallic filament	10·0*
Ordinary arc	20·0*
Vacuum tube	40·0*
Firefly	99·9

* This is in lamps only, and is exclusive of loss in conversion from coal to electric mains, which will discount it 80 or 85 per cent.

The last item has been inserted for comparison. If we only knew the firefly's little secret, we should be able to put all our energy into pure light, and save both our eyes and our pockets. At the present time our only method of getting a larger proportion of luminous rays is to increase the temperature of the radiating body by which the rate of the frequencies is increased and forced towards the luminous part of the spectrum.

Modern life and modern lighting have already given an abundance of work to an increasing army of ophthalmic surgeons, and created a state of things that loudly demands that those who deal with the forces of radiation should understand the powers and the dangers of that which they handle, and the capabilities of those organs for which it is intended.

Much information has recently been forthcoming as to the behaviour of the eye under various applications of light; and the architect would find that even a brief inquiry into these matters, particularly that relating to the perception of colour, would be useful to him in his study of the art of illumination.

The conditions of good artificial lighting should approximate to those of daylight, which may thus be stated: Sufficiency of light, perfect steadiness, effective diffusion, freedom from violent contrasts, a downward direction (preferably oblique), and colour as white as possible. Unfortunately, these conditions are violated in nearly every lighting installation, and we all, more or less, unconsciously suffer therefrom.

Injury may be caused either by an insufficiency or by an excess of light, which really means an excess of the wrong sort or of wrongly-applied radiation. Insufficiency of illumination is a leading cause of eye-strain, with its train of nervous disorders. Dr. Kerr, in a report upon some London schools, found that in children under six years of age the eyes of 3 per cent. were defective, at eleven years the proportion rose to 11 per cent., and in the older classes to 25 per cent. It was also pointed out that 18 per cent. of the schools were badly lit. The conclusion is obvious. Among the studious, clerical, and close workers, from 50 per cent. to 70 per cent. have defective eyesight, largely myopia; and yet myopia is said to be unknown in savage life, and rare among seamen and farmers.

Light is a good servant, but a bad master. If properly controlled, we cannot have too much of it; for, in common with any other power distribution, it can be so much more effectively and suitably applied when there is an abundance of power behind. Sunlight often reaches as high as 8000 foot-candles. We find that diffused daylight of 2000 foot-candles is both comfortable and

healthy; while from that to 100 foot-candles is daily experience. Such intensities are far in excess of anything we ever get in artificial lighting; for a general illumination of 5 foot-candles would be considered quite brilliant. Nevertheless, if the light is properly diffused, there is no available intensity that is too great; and I quite differ from those who maintain that a high general illumination is necessarily fatiguing. I have sat under 22 foot-candles with comfort and pleasure; and for the same reason that people unconsciously gravitate to the light, so a high diffused illumination will come to be generally appreciated.

The evils of excess arise chiefly in exposed lighting and in intensely brilliant surfaces; for while diffuse reflection seldom exceeds 1 candle power per square inch, the intrinsic brilliancy of sources are, by comparison, excessively high. Thus the—

		Candle Power per Square Inch.
Candle-flame	averages	2
Gas-flame	,,	3
Oil-lamp	,,	4
Incandescent gas	,,	25
Carbon glow lamp	,,	450
Metallic filament lamp	,,	1,000
Limelight	,,	5,000
Flame arc	,,	5,000
Arc lamp crater	,,	20,000
Sun at zenith	,,	600,000

And it should be remembered that it is the intrinsic brilliancy, and not the total flux, that counts physiologically.

The infra-red rays reach the retina just as readily as light, and give trouble accordingly; but the more destructive are the ultra-violet rays, the effects of which have been fully detailed in several recent medical essays. Happily, ordinary glass absorbs certain frequencies of these rays, and a special glass all of them. Glass globes are, therefore, essential to high-power lamps. Quartz glass, however—used for its refractory qualities—is no protection.

Æsthetics are frequently the sole *raison d'être* of an architect's employment, and that would be for the satisfaction of one sense only—sight. And seeing that form and colour are a mental sensation due entirely to illumination, it follows that the character and direction of that illumination entirely governs the situation. Let it be noted (1) that a white light, and that only, will reveal a complete range of colours; (2) that flat decorated surfaces require a uniform and sufficient illumination, so as to avoid gloss; and (3) that the natural means of exhibiting architectural features and sculpture is a partly diffused downward or oblique light.

General Principles.

The whole case of good lighting is embodied in a very simple axiom: The purpose of artificial lighting is to make readily and properly visible the things required to be seen. This may be made more definitive by the following rules:

1.—The lamps or other sources of light to be so disposed that they do not occupy the field of vision.
2.—The illumination to be sufficient to cause the objects to appeal at once and with comfort to the eye.
3.—For general illumination, the light to be well diffused, with a preponderating downward direction, freely flooding ceilings and walls.
4.—Local lighting to such as desks, benches, exhibits, &c., to be specially suitable, and in most cases adjustable in position and power.
5.—The colour to be as pure and white as possible. Monochromatic light, as a rule, to be avoided.

General illumination may be broadly considered as of two kinds—direct and indirect; but there may be modifications and combinations of both. Direct lighting is that in which the light radiates immediately from the source to the objects to be viewed. Where glass shades are used, it would still be considered direct lighting. This method is usually economical and convenient; but it should be used only where it can be made to accord with the foregoing rules, as, for example: (*a*) Ceiling lights in lofty rooms, where the eyebrows, which are designed to screen the eyes from the sky, will serve the same purpose at night, and in such cases no lights should subtend an angle greater than 30° from above the eye. (*b*) Direct lighting would also be used in places that are normally viewed in one direction—as shop fronts, churches, public halls, picture galleries, &c., in which the lamps may be recessed or screened. (*c*) In any circumstances where the lights do not come before the eyes.

The art of shading consists in the use of shades that will afford complete protection to the eyes, with a minimum loss of total light, to produce better illumination and to increase visual acuity. The word "shade" implies some protection; but what are commonly called "shades" are ridiculous misnomers. They may be classified into transparencies, diffusers, and real shades.

It must be obvious that a globe, bell, or screen of glass that is transparent, or so lightly figured or finished as to be nearly so, can afford no protection to the eyes, particularly to those who seek to find something "pretty" in it; and yet the greater part of the stock of the average fittings manufacturer consists of this sort of thing.

In diffusers and translucencies, the object is to distribute the intrinsic brilliancy of the light over the visible area of the globe or shade. Nothing does this more perfectly than opal glass, though with considerable loss by absorption. Prismatic glass aims at the same object, and, though it passes more light, is usually less successful. Frosted or ground, iced, opaline, and the like are improperly counted as diffusers, for the light remains as a brilliant centre.

Real shading is effected by opaque or semi-opaque screens—the latter passing not more than 1-10th candle power per square inch—just enough to cover the bare lights and no more. By far the greatest proportion of light will, by this means, fully and directly flood ceiling, walls, and other objects; and the practical result will be a pleasing and soft effect with easy discernment of detail.

Indirect lighting is that in which the illumination is obtained from surfaces illuminated by concealed lights. It usually presupposes a white ceiling and upper walls or other extensive diffusing surfaces—the larger the better. The results are great uniformity of lighting, approaching practical daylight more nearly than with any other system, while admitting of greater distinction of vision and affording comfort to the eye.

[In the next sections of the paper the author dealt with photometry and luminometry, and lamps and polar curves.]

Practical Application.

A few notes on the practical application of the foregoing remarks to the lighting of churches, schools, hospitals, public libraries, and factories may be of service. The important subject of domestic illumination was too large to be included in the paper.

Churches.—The simple-minded person would suppose that the beautiful decorations of many churches are placed there to be seen. But go into the first church you may meet during full evening service, and you will probably find that the upper two-thirds will be lost in a gloom that is heavy and depressing, while the lower third will be largely obscured by dazzling points of light, and the chancel scarcely visible. Every face will have a hard, patchy appearance due to want of diffusion; and if the preacher is at all interesting, two inexorable pulpit lights will send you home with smarting eyes. It is not a question of brilliant lighting *versus* the mystic gloom, which some architects have advocated as conducive to worship. The "dim religious light" of a morning service may have its charms, being usually relieved by softly-illuminated surfaces that can be seen with comfort. But the obscurity of an evening service, pierced by obtrusively brilliant points that dominate everything and refuse a haven of rest to the baffled eyes, is not likely to be helpful to worship—excepting by way of penance. This is but one point of consideration among many to be found in church lighting. Treatment will depend upon the style of architecture and many contingencies. Sufficient light for practical purposes is the first consideration—1·5 foot candles at the pew level; and the next is eye comfort. A general light is all that is required.

Schools.—In a number of modern Board Schools I have found the artificial lighting to be (*a*) insufficient; (*b*) too uneven, having usually but four gas or six electric glow lamps to a class of forty children, and these too near the centre of the room; (*c*) in the class-rooms unprotected lights in nearly every case in the direct range of vision of both scholars and teachers; and (*d*) the blackboard, which needed more, really had less light than elsewhere.

Dealing with the class-room only, there are three methods of lighting, any one of which may be made satisfactory: Indirect lighting by high-power lamps illuminating a white ceiling and frieze. Direct lighting from ceiling lights pendant about 2 feet, to get diffused light from the ceiling and not placed centrally, but nearer the left-hand window. If pendants, reaching to 6 ft. 6 in. or 7 feet from the floor, are continued to be used, there should be eight or ten of them where there are now four or six; and each should have an opaque shade in which the light can be entirely recessed. The desks should have a minimum of 3 foot-candles. For pencil drawing and needlework, special desks or tables should have an illumination of 8 foot-candles.

Hospitals.—The ward unit of (say) twenty beds should be provided with a general illumination of about 0·5 foot-candle, with protected or indirect illumination. The sisters' and nurses' tables should have lamps adjustable—without dusty cords—to from 3 to 8 foot-candles; the latter for dark needlework, with dark shades that will entirely recess the lamp—preferably dark green opal. The patients' lights are too often conspicuous by their absence; the nearest light, usually a single glow or gas-lamp, being 12 or 14 feet distant. There should be a screened light at the head of each bed, placed low behind, and on one side of the head, giving an illumination of 3 foot-candles, and adapted for use for medical examination.

The dispensary is usually the worst served. Dispensers have complained of the worry of reading the prescriptions in the inadequate light; while many bottles stand in semi-gloom. A shaded light, giving 4 or 5 foot-candles, is required to each man. The shelves should be illuminated with screened lights; while special facilities are desirable for reading graduated measuring glasses.

The operating theatre calls for more than usual consideration, for a large amount of surgical work is done after dark. Here, again, there is no established form of lighting; each hospital having its own arrangement, and not all satisfactory. The essentials to success may be thus summarized: (*a*) White ceilings and walls, pale grey or green dado, and darker floor. (*b*) Separate general illumination, with screened lamps over the sinks and sterilizers. (*c*) The lights to the operating table should not be clustered together as they commonly are—forming black shadows—nor be placed directly over the table, whereby the surgeon's work is obscured by his own head and hands. (*d*) Lamps must not radiate heat on the patient or on the surgeon's head. (*e*) All septic risks must be avoided; therefore, there must be no dust-creating cords and pulleys or fittings, and glass must be smooth

and easily cleaned. Well-made arc lamps may be used—either direct-lighting white flame arcs placed over a diffusing ceiling light, or, where there is no skylight, indirect lighting. Both afford a splendid light. There is an excellent scheme in practice in Germany, wherein isolated beams of light are concentrated on the table from a projector lamp outside the room, whereby dust, heat, and the intrusion of workmen are quite precluded.

Public Libraries.—There is perhaps no greater tax on nervous energy than continuous reading of educational literature. It is important, therefore, that in libraries the further burden of eye-strain should not be imposed on the reader by misplaced and inadequate lighting. Better the plainest building, where the books can be read in comfort, than a marble mausoleum of literature that chills enthusiasm and worries the eyes of the student. I have seen many handsome libraries, but not one properly illuminated. The ordinary library requires a small measure of well-diffused general lighting—0·5 to 0·75 foot-candles. The principal feature, however, is the local lighting, which should consist of (1) a separate light to each reader—on his left—with an opaque or semi-opaque shade; (2) every desk-lamp should be adjustable, so as to permit of a modification of from 2 to 10 foot-candles, and under the reader's control; (3) the reader should be expected to switch on and off his own light, which would effect great saving.

Factories.—Holland is the only country that has framed an Act which properly stipulates the amount of light to be provided, and where such as embroiderers, jewellers, and draughtsmen workers are required to have a minimum of 15 bougie metres (about 1·5 foot-candles), and all others 10 bougie metres. British legislation is confined to enamelling shops and underground bake-houses, which are respectively to be "efficiently" and "adequately" lighted—expressions which mean nothing in particular, and are therefore useless. Definite legislation is urgently necessary, for there is still an overwhelming majority of workers under conditions that are ruinous to eyesight and health. In machine shops, the majority of accidents are said to occur after 4 p.m., and no wonder; for brilliant points of light against a dark background must baffle the eyes and deceive as to distances. What is wanted is a well-diffused general light, aided by whitened and illumined ceilings and walls. Nothing is better for this purpose than indirect lighting. Screened local lighting should then be added to all points requiring the attention of operatives, and to benches, desks, &c. Money spent in liberal lighting of factories and workshops is repaid a hundredfold in more and better work.

Surface Combustion.

The following appeared in "Engineering Record" for the 30th ult.: "Surface combustion is the latest of those practical applications of long-known phenomena which occasionally startle the scientific world into a recognition of the importance of its neglected work. Nearly a century ago, Sir Humphry Davy pointed out that when a combustible gas and air are mixed in proper proportions, and forced into contact with some refractory porous material, they could be burnt without flame, yet produce a very high temperature. This phenomenon of flameless combustion was allowed to lie undeveloped until quite recently, when Professor William A. Bone and Mr. C. D. M'Court began to develop it for practical applications; and they are confident that by means of it 90 to 95 per cent. of the actual heating value of fuel gas can be made directly useful in heating crucibles, furnaces and steam-boilers. Such complete innovations as this can only make their way into actual use by successful service tests; for in developing every new apparatus, practical difficulties arise to vex the soul of the inventor who fondly but foolishly thinks he can foresee every trouble. Flameless combustion, however, has apparently reached the stage where it is safe beyond the reefs of serious trouble; and the problem is to find the limits of its field of usefulness."

Midland Junior Gas Association.—The next general meeting of the Association (which should have taken place last Saturday) has been postponed until the 27th inst., when Mr. James Hewett, Distribution Engineer to the City of Birmingham Gas Department, will read a paper on "The Distribution of Gas: Problems and Solutions."

High-Pressure Gas Lighting Lectures.—The outdoors staff of the Brentford Gas Company recently had a lecture delivered to them by Mr. A. J. Whyte, of the James Keith and Blackman Company, Limited, on the subject of high-pressure gas lighting. The practical treatment of the subject by an expert in daily touch with it was of much value to those who heard the lecture.

Removing Rust from Steel Pipe.—Pickling steel plates in hot dilute sulphuric acid in order to remove mill scale, rust, and dirt was one of the subjects discussed in connection with a paper on steel pipe presented by Mr. Alfred D. Flinn at the last meeting of the New England Water-Works Association. The pipes are 9 ft. and 9 ft. 6 in. diameter, and are employed on the syphons of the Catskill aqueduct. It was stated that a weak and comparatively inexpensive solution is much more effective than a strong solution in securing a proper cleaning, and that heat (120° to 125° Fahr.) greatly accelerates the action of the acid. On certain work mentioned, a 5 per cent. solution of oil of vitriol was used; and one of the speakers confirmed this practice. He employs a per cent. solution of sulphuric acid at about 180° Fahr.

NOTES ON GAS ACCOUNTS.

By C. H. Foden, of Manchester.

[A Paper read before the Manchester and District Junior Gas Association, Jan. 13.]

In presenting the following notes on gas accounts, attempt has been made to deal with the subject mainly from the point of view of a gas manager, as the majority present represent the technical rather than the commercial side. But now that the stress of competition is severely felt, it is incumbent that a gas manager should be equipped with some knowledge of accounts, to enable him to obtain a complete grip of the works he controls. Attention has therefore been directed to that part of the accountancy system which mostly concerns the manager; a brief survey of the whole being at the same time given.

Legislation for Gas Supply.

Gas undertakings are controlled by the Gas-Works Clauses Acts, 1847 and 1871, and the Gas and Water Facilities Acts, 1870 and 1873. Authority to supply gas may be obtained by Act of Parliament or by Provisional Order; power to obtain this Order being given by the Acts of 1870 and 1873. Local authorities are empowered, under the Public Health Act, 1875, to contract with any person for the supply of gas; and where there is no company authorized to supply gas, local authorities may undertake the supply. They may also acquire the gas undertakings situated in their own areas, subject to the sanction of the Local Government Board. The Acts of 1847 and 1871 mainly control gas companies which are also subject to the usual Companies Acts. The Act of 1871 prescribes the form of accounts to be adopted (described later). This form is also adopted by most local authorities, though there is still lack of uniformity in treatment.

Dealing first with details of income and expenditure, the systems here described are those followed by the Manchester Corporation gas undertaking.

Income.

Sales of Gas by Ordinary Meters.

This class is by far the greatest source of revenue; and the first step is the entering of consumers in the rental register from the connecting note. The registers, which are kept on the loose-leaf system, also show the amount of hire to be charged for stoves and "stand-by" meters—this being added to the usual quarterly gas bill.

The meters are read about twice each quarter; the second reading as near quarter-day as possible. This latter reading is entered from the meter-reader's book to the consumer's account in the register, where it is charged out. Each consumer has a separate account in the register covering a lengthy period; and these accounts are next summarized in quarterly books, in districts, to facilitate collection. The cash, on payment either to the collector or in the office, is posted to the credit.

Attention might be drawn here to the following special powers given to gas undertakings for security of payment:—

(*a*) The Gas-Works Clauses Act, 1871, gives power to demand, before gas is supplied, the payment of a sum of money as security, which is deposited with the undertaking at interest—such sums to be refunded on the consumer ceasing to use gas.

(*b*) Power is also given to summons for accounts in arrear in the ordinary Police Court, instead of the County Court.

Many local authorities and companies have varying systems of allowing discounts providing the accounts are paid within a certain time-limit. The advantage of the systems is primarily to encourage the prompt payment of accounts—obviously to save collection.

Sales of Gas by Automatic Meters.

Instead of consumers' accounts being kept in ledgers, as in the case of ordinary consumers, the accounts are recorded on cards, which are kept in cabinets in street order. This card serves the purpose of meter-reader's book, register, and collector's book. The clerical staff assemble daily for each inspector the cards of the consumers whose meters are to be inspected the next day; these cards being placed in a case to ensure none being lost, and for easy reference. Inspectors are also given duplicate receipt books, used on alternate days, which, together with the cards, are handed in at night with the cash collected from the meters. Audit of the cards and receipt book is made next day. This class of business being, of course, cash, no bills are used; the receipts given on collection showing details of consumption. Consequently, the charging for stoves and stand-by meters is accounted for on a separate series of cards. These cards are entered up from the application cards on a stove or meter being fixed, and accounts for hire rendered as due. The number of automatic meters in use in Manchester at March last was 63,663, which are inspected about once in five weeks. The weight of copper collected from them last year was over 175 tons.

Mention should be made of the following, as being applicable to each of the foregoing classes of consumers: Inspectors' districts are frequently changed, so as to prevent collusion with consumers and misappropriation. The simple hire of gas-fires is charged at September and December quarter days; the object being not to charge hire in the summer months when the fire is not in use. The maintenance of gas-fires is undertaken by the Corporation;

the maintenance men being supplied with card records on which to obtain the signature of the consumer when the fire is attended to. Gas-burner maintenance has not yet been undertaken; but on its introduction the systems mentioned previously can easily be extended to cover it. Due allowance should be made in the annual accounts for gas consumed after the last reading of the meters to the date of the accounts.

It is interesting to observe the effect of stoves, particularly cookers, on the consumption load; the load line between 6 a.m. and 2 p.m. having risen in Manchester 38·2 per cent. since the introduction of free cookers in 1903.

Public Lighting.

The consumption in Manchester is obtained by means of regulators affixed to each lamp; the number of lamps in use being duly recorded, together with periods burning. The supervision and maintenance are done by the Street Mains Department and by a staff of lamplighters. Incandescent burner maintenance is effected by a separate staff from the lamplighters; the latter reporting defective lights. This course results in a very careful use of mantles, as the mantle average per lamp per district is ascertained by the stores system; districts being under the control of foremen, who watch their averages closely.

Private lamps, low and high pressure, are supplied and maintained at a fixed hire per annum.

Residual Products, &c.

Dealing first with deliveries by road, the procedure is as follows.

At the entrance to each depôt, a gateman is stationed, whose duties are to regulate traffic, direct callers, and exercise a certain supervision over the workmen entering and leaving.

Excepting sales of coke by measure, which are dealt with later, buyers are handed at the sales office a cardboard ticket perforated down the centre, showing on each half the quantity and quality of material to be loaded up, and also whether cash or credit. One portion is termed the "Yard Half," and is collected by the men in charge of the material, and placed in locked boxes. On returning loaded to the sales office, if a credit sale, the buyer is handed a weigh-ticket, and proceeds out of the works, giving up to the gateman the other half of the cardboard ticket, which is called the "Pass Out."

To deal with cash sales, a particular deviation is made; the "Pass Out" being returned to the sales clerk, who makes out the weigh-ticket in triplicate, which shows also the value of the material and receipt for cash. Two of these weigh-tickets are then handed to the buyer, who gives one up to the gateman on leaving. The security gained by this procedure will be quite obvious, since the buyer may give up either ticket; so to do anything irregular the clerk would have to be in collusion.

There is also a change made when material is delivered by Corporation carts. The carters are instructed what material to load up, but do not know its destination. On returning loaded to the office, if it is a cash sale the procedure is the same as described before, except that the carter delivers the receipted weigh-ticket to the buyer in exchange for cash, which is handed in on the carter's return. If a credit sale, a weigh-ticket is made out in triplicate, showing weights only, no money values, two of which are given to the carter, together with a pass-out, which is collected at the gate. On arriving at his destination, the carter delivers the weigh-tickets to the customer, who retains one and signs the other; the carter bringing the latter signature note back to the works. The saving in time effected through the writing of the delivery and signature notes in one operation will be noted.

Regarding the measure sales of coke, these are controlled by cardboard tickets only, purchased at the office for cash—one portion being retained by the man in charge of the coke, the other being collected at the gate on passing out. The tickets are for two quantities—measures and half-measures, representing about 1 cwt. and ½ cwt. respectively.

The tickets are uniform at all works. Coloured cardboard tickets are used for the various materials sold; credit sales being distinguished by a red stripe across. Coloured weigh-tickets are also adopted in book form, six or eight tickets to a page; carbon sheets being used to obtain copies.

Mention might be made that there is a system of deposits in operation for customers from whom the sales clerks deem it necessary to obtain a payment in advance. Receipts for these deposits are made out in triplicate—one for the payer, one for the audit office, the other remaining at the works. Such sums are entered in the daily cash system, and are appropriated on the sale being effected.

The tickets and weigh-notes collected at the gate are placed in locked boxes. These boxes, together with those from the sales office and down the works, are forwarded to the audit office next morning; also returns of tickets issued and weigh-ticket books containing second and third copies, which are all reconciled. The cash is forwarded to the cashier daily.

Consignments by rail are, as a rule, on credit; and the system in use is that the weights of the waggons are entered by the weigh-clerk in a duplicate day-book, together with the consignee's name, destination, &c. One copy of these particulars is forwarded daily to the audit office; advices of consignments being, of course, duly sent to the purchaser. As a safeguard, an arrangement is in force whereby the railway companies furnish monthly returns to the audit office of waggons passing in and out of the works; such returns being properly agreed with works entries.

For the purposes of the annual accounts, the stocks of residuals, &c., on hand are valued below current rates, to allow for depreciation and fall in prices.

EXPENDITURE.

Dealing first with purchases of coal, this comes in by rail, and weights are entered in a duplicate day-book, also the name of the sender, material, and waggon number. One copy is sent to the audit office, together with the waggon labels; and consignors' advices, which are sent direct to that office, are compared with the works weights. Receipts are analyzed daily into a "coal received" book, under classes of material; the approximate weight of material carbonized daily being also entered into a classified "coal carbonized" book, totals of which are deducted periodically from receipts, thus showing stocks.

Oil for carburetted water-gas manufacture is received by boat, and measured by our own chemist, who also certifies stocks. Fire-clay goods are received by rail, weighed as a precaution, and counted out by the foreman brick-setter, who also accounts for how the goods are used. Lime, oxide, &c., are received by the storekeeper, sent on to the processes, and charged direct.

Stocks are taken at the year end by an independent stocktaker, compared with the books, and cast out; due allowance being made for depreciation and falling markets. All the preceding stores are contracted for, and ordered by letter to be delivered in specified quantities over a certain period.

Dealing now with stocks of stores for general use, these are controlled as follows.

General Stores Organization.

Stores required to be ordered are specified on requisition notes together with actual stocks on hand. These notes are forwarded to the stores clerk, who compares with actual book stock; the differences being noted and adjusted, and consumption in a given period being also added to check extravagance. On the manager's approval, the goods are ordered; the name of the contractor and order number being stated on the requisition note, which is then forwarded to the storekeeper, who endorses thereon the receipt of the goods and quality. The issue of stores is accomplished by the presentation of an order duly signed by a foreman. In the case of the workshop stores, no order is used; the foreman mechanic countersigning the storekeeper's summary of issues.

Credit notes are given by the storekeeper for material returned to stores, and transfer slips are issued for transfer from one job to another. The storekeeper also makes out a returns note for stores returned to sender.

Records of stores are kept in ledgers in the offices; receipts being posted to the debit, issues to the credit. Stocks are taken by an independent person, compared with the stores ledgers, and differences, which should be few, adjusted.

Regarding meters and stoves, these are effectively controlled by stock books showing receipts and issues.

Stocks on hand in the general stores at the end of the financial year are extracted from the stores ledgers, cost out at current contract prices, as the stores are constantly being replenished in most instances. Where they are not, the goods are depreciated accordingly.

Special attention can, with advantage, be drawn here to the system whereby carters and others bringing stores in have to give up on leaving a special "Pass-out" ticket.

Time and Wages, &c.

The time of workmen is taken by the timekeeper, whose records are checked with returns made by the various foremen—special forms being used for piecework. The wages are calculated by the works staff, verified by the audit staff, and paid by the cashier's staff—the latter, of course, being independent of the works staff. The workmen have two checks, one for time and one to present to the pay clerk when demanding wages.

Time is allocated by means of time sheets and the foremen's returns. It has been found a good method to separate the analysis from the wages book, having a column in the latter in which totals of processes, shops, &c., are put; these totals being carried to the analysis book. A card register containing the records of the workmen employed is of considerable advantage.

COSTS.

The various manufactures carried on at the works are recorded in comprehensive process books containing the materials used and the various products obtained. By the careful manipulation of other books of records, much information can be obtained in the aggregate for the process books. Periodical costs should be ascertained from the cost ledgers and process books. The manufacture of sulphuric acid and sulphate of ammonia is entirely apart from the gas-works; and separate books and accounts are kept. Transfers from one department to another of materials used in manufacture are noted on transfer slips, &c.; the receiving processes being charged on the most favoured purchaser plan.

With a view to getting at the cost of constructional work and repairs, a system of works orders has been established for dissecting costs. Standing orders are used to show the cost of the upkeep of various sections of the works, machinery, &c. Special orders are issued when the cost of a complete job is required; this cost, in turn, being charged to a standing order stores account, or debited to personal accounts. The standing order costs are kept on ledger sheets; those of special orders on cards. This

system of works orders enters into the accounts proper; being an integral part.

FORM OF ANNUAL ACCOUNTS.

Nos. 1 and 2—Statement of share and loan capital authorized and raised.

No. 3—Detailed capital account kept on what is called the double account system, which shows upon the credit side what moneys have been raised and on the debit side how such amounts have been spent in acquiring or constructing the undertaking, together with the balance unspent. In the case of a company, this balance can be used as working capital; but with local authorities it is earmarked for certain specific purposes. It should be noted that this account shows original outlay; depreciation being allowed for by creating a separate depreciation account.

No. 4—Revenue account detailing on the debit side the costs of manufacture, distribution, and establishment charges; while the credit side shows the income from all sources. The balance of this account is then carried to

No. 5—Net revenue account. This account contains the charges for interest, depreciation in the case of companies, sinking fund for the redemption of debt in the case of local authorities, and the disposal of the balance.

No. 6—The next accounts are usually summaries of transactions on reserve fund, depreciation fund, or renewals fund.

No. 7—General balance-sheet, setting forth the totals of No. 3 (capital account), floating assets and liabilities, cash balances, and reserves, &c.

Nos. 8 and 9—Statistical statements showing coal carbonized, residual products, &c.

CAPITAL, &c., ACCOUNTS.

Loan, Share, &c., Capital.—Companies usually provide the capital required to construct gas-works by the issue of shares and stocks, also by raising loans on mortgage, debenture bonds, or stock. Since 1877, companies have been required to offer all additional capital raised for sale by auction or tender. The usual books kept by trading companies are necessary. Local authorities raise the money required by loans on mortgage; the sanction of the Local Government Board having first to be obtained. The Board fix the period within which the loan must be repaid; and a sinking fund is created to provide the money in this period. This fund, unless used in the redemption of debt immediately, is usually invested outside the works, and is so calculated that the annual charge against revenue is the same throughout the period.

Capital and Revenue Expenditure.—The only expenditure that can be capitalized is that necessarily involved in constructing and equipping the works so as to make them capable of earning revenue. After the works have been once equipped, all expenditure other than in the extension of producing capacity must be charged to revenue. Local authorities of late have made a practice of charging capital expenditure for which the Local Government Board will not grant borrowing powers.

Renewals or Depreciation Fund and Reserve Fund.—The renewals or depreciation fund is a charge against revenue built up to safeguard the capital account. There appears to be doubt whether local authorities should provide a renewals fund in addition to the sinking fund; the latter fund being considered adequate provision for depreciation. However, a special fund is provided when the period on which the sinking fund is based is too long. The reserve fund, on the other hand, is created out of profits for the purpose of equalizing the revenue account, and is available for extraordinary contingencies. These funds must be invested outside the undertaking in the case of companies.

Rates, Taxes, &c.—Buildings, plant, mains, &c., are assessed for rating purposes as though the occupiers were tenants, commonly called the hypothetical tenant. For income-tax purposes, gas undertakings are assessed under Schedule "A," on the basis of one year's trading, not on the three years' average, as is the case with tramways and similar undertakings. The usual deductions should be claimed, including actual repairs and renewals and that proportion of profit made out of rate-aided departments, such as public lighting, &c. Care should be taken to see that any legitimate deduction that cannot be given effect to by reason of insufficient profits is carried forward to future years.

It will be noted that, as stated at the commencement, matters appertaining to works management only have been dealt with at length, as being of special interest to members.

[The author exhibited specimens of the various forms, &c., that he referred to in the paper.]

Discussion.

Mr. T. W. SMITH (Heywood) said Mr. Foden had given the members a great deal of information that would prove very useful. At Heywood they had just started the card system; and if, as he believed would be the case, a saving of time was shown, it would be extended. Until that day, he had failed to understand why Manchester used receipts for deposits in triplicate form in regard to residual products. Now he recognized the value of the system, which formed a very good check. As to the taking of stock, he was of opinion that the process would work out more cheaply in large works than in small undertakings.

Mr. A. HODGSON (Hurst) asked if the author could tell them the number of mantles used per lamp per annum in the public lighting. He would also like to know, in regard to general stores organization, whether Mr. Foden intended to convey the idea that there was not an annual stocktaking.

Mr. W. L. HEALD (Preston) inquired what happened if the carter supplied with the usual forms did not get payment when he delivered coke.

Mr. J. ALSOP (Stockport) expressed the opinion that the adoption of the card system would be advantageous to all gas undertakings. It had just been introduced at Stockport.

Mr. FODEN, in reply, expressed regret at being unable to furnish Mr. Hodgson with the information he asked for in regard to the number of mantles per lamp. As to his other question, the answer was that the stock of coal was always taken at the end of the financial year; but in regard to other stores, they obtained the stock from the ledgers in the way he had indicated. With reference to Mr. Smith's observations, he said the card system was just as adaptable to small as to large gas-works, though he admitted that the loose-leaf system allowed of their getting longer records. As to Mr. Heald's question, in the event of the carter not receiving cash on the delivery of coke he retained the receipt ticket. They had to allow carters to exercise a certain amount of discretion. If the carter was dubious, he did not leave the receipt, but obtained one for delivery. If payment was not made in due course, the collection of the money was handed over finally from the works to the ordinary collector to deal with.

On the motion of Mr. J. ROBINSON (Altrincham), seconded by Mr. S. CARTER (Garston), a hearty vote of thanks was accorded to Mr. Foden for his paper.

GAS SUPPLY FROM SEMET-SOLVAY OVENS.

An American Town's Installation.

The Semet-Solvay Company have just taken a contract for the erection of gas-ovens with a capacity of somewhat more than a million cubic feet per day, for the supply of Waukegan, Illinois. The North Shore Consolidated Gas Company supply the town of Waukegan, and the territory south of it, down to Winnetka, a distance of about 25 miles. All this territory, except Waukegan, is now supplied by high-pressure lines, through which the gas is pumped at an initial pressure of (approximately) 25 lbs. The high-pressure service is controlled by pressure-control valves at the meters of the consumers.

According to the "American Gaslight Journal," the new plant is being built on a piece of property recently acquired by the Company, a short distance north of its present plant, and very conveniently located as to railroad service. The site is amply large to provide for any reasonable increase in plant required by the rapidly growing business of the Company.

The plant consists of thirteen ovens of the Semet-Solvay gas-oven type. The Semet-Solvay Company have, it is said, been developing for a number of years the manufacture of illuminating gas from its ovens; and the experience gained in the production and sale of over 20 million feet daily from their several plants throughout the country has been applied to their gas-oven in connection with the various features of the system which seem especially applicable to the manufacture of illuminating gas.

The plant will be of special interest to gas engineers, from the fact that it will probably be the first installation in America of a straight gas-oven plant, to deliver for sale the full amount of gas produced. The ovens are to be fired with producers employing the Doherty system of utilizing flue-gas in the control of the fuel-bed temperatures, and which system has worked out very successfully in its application to gas-oven practice. In this plant each oven has its own producer. Under existing conditions, this arrangement was selected as preferable to an isolated producer plant supplying gas for all the ovens.

The coal will be delivered from railroad car into coal-hopper; going thence to the crushing and pulverizing mills, and on to the coal-bins above the ovens. All the coal will be pulverized to about $\frac{1}{8}$-inch size, or smaller. The work of the Semet-Solvay Company, on coals from a large number of points in the United States used in the production of high-grade metallurgical coke, has shown that this fine pulverizing is of material help in the production of coke of uniform composition and cell structure. The ovens will have a capacity of about 9 tons each, and will be charged through the usual charging holes in the roof, by an electrically operated charging car. When ready, the coke will be discharged from the ovens (by the usual coke-oven type of pusher) into the "quenching car," which is well known in the Semet-Solvay installations, and there the coke is quenched by the application of a large stream of water. This method of quenching, it is claimed, produces a dryer coke than any other method that has been developed commercially. The coke as produced will be crushed, screened, and delivered to a storage bin for shipment.

The foul main will deliver the gas to the condenser house, which is a brick and steel building, 48 feet by 64 feet, with side bays 16 feet high and the middle bay 34 feet. This building is to contain the condensing and scrubbing apparatus, which is of the Doherty washer-cooler type. The ammonia distillation apparatus occupies one end of the building. Other parts are occupied by the exhausters, pumps, machine shop, &c., "thus making a very compact installation, conducive to efficiency of operation and low labour cost." It is proposed to have the plant ready for operation early in the coming summer.

GAS AND ELECTRIC LIGHTING IN THE CITY OF WESTMINSTER.

Comparison of Cost for Twelve Months.

We give below some figures showing the results of tests of gas and electric street-lamps in the City of Westminster, with a statement of the comparative costs extending over a period of twelve months. They form part of the second series of tests made by the City Engineer (Mr. J. W. Bradley, M.Inst.C.E.), and are taken from his fourth quarterly report for the past year. They are dealt with in our editorial columns. But it may be mentioned here that the number of hours the lamps were burning was 3940; and that the photometer used in this series of tests was of the "Flicker" type. The one employed in the first series, extending over a period of seven years and six months, was of the Bunsen type.

Description and Position of Lamp.	Number of Lamps in City of Class Specified.	Number of Tests Made During Quarter.	Average Candle Power per Lamp.	Capital Cost of Lamp.	Cost per Annum under Current Contract Illuminant, Lighting, and Maintenance.	Total Cost per Candle Power per Hour.	Total Cost.	Total Cost per Candle Power per Annum.	Average Total Cost per Candle Power per Annum according to Number of Tests up to Date.
				£	£ s. d.	d.	£ s. d.	d.	d.
(1) Electric arcs, "Oliver," open type double carbon (Charing Cross, West End, and City Electricity Supply Co.), opalescent globes	100	6	550	40	28 0 0	·00332	3,000 0 0	13·08	12·60
(1A) Do. do. do. Strand, do. do.	21	6	466	40	27 10 0	·00385	619 10 0	15·16	13·82
(1B) Do. do. "Oriflamme" Strand do.	2	..	..*	40	27 10 0	..	59 0 0	..	4·93
(1C) Do. do. do. Whitehall do.	1	2	1,228*	40	28 0 0	·00148	30 0 0	5.83	5·83
(2) Electric arcs, Brockie-Pell lamps (Westminster Electric Supply Corporation), opalescent globes	957	13	429	..	21 0 2·4	·00298	20,106 11 4	11·74	10·97
(2A) Electric (two) 32 c.p. Osram lamps, metallic filaments (do. do.), on refuges Buckingham Palace Road	141	4	49	..	3 17 2·4	·00428	540 8 0	16·86	18·01
(2B) Electric flame arcs (do. do.), "Jandus" lamps, Marble Arch (minimum candle power under the contract is 900 c.p. for each lamp)	5	5	1,418*	..	14 0 0	·00064	70 0 0	2·52	2·22
Totals and averages of electricity	1,227	36	..	..	..	·00276	24,425 9 4	10·86	..
				£ s. d.	£ s. d.	d.	£ s. d.	d.	d.
(3) High-pressure gas-lamps, 3000 minimum candle power lamps, with three inverted burners, Regent Street and Piccadilly Circus	20	16	4,118	20 0 0	22 0 0	·000340	460 0 0	1·23	1·39
(4) High-pressure gas-lamps, 1800 minimum candle power lamps, with two inverted burners—Whitehall, Parliament Street, Victoria Street, Pall Mall, St. James's Street, Piccadilly, Aldwych, Kingsway, Charing Cross Road, Shaftesbury Avenue, &c.	173	12	2,074	18 0 0	15 10 0	·000481	2,837 4 0	1·89	1·94
(5) Low-pressure gas-lamps, 300 minimum candle power lamps, with five inverted burners	267	10	358	4 0 0	6 10 0	·001139	1,788 18 0	4·49	4·47
(6) Low-pressure gas-lamps, 180 minimum candle power lamps, with three inverted burners	969	10	214	3 10 0	4 10 0	·001330	4,530 1 6	5·24	5·29
(7) Low-pressure gas-lamps, 90 minimum candle power lamps, with two inverted burners	1,483	10	128	3 0 0	2 16 6	·001415	4,411 18 6	5·57	5·59
Totals and averages of gas	2,912	58	..	..	..	·000941	14,028 2 0	3·68	..

* Owing to the constant jumping and flickering of these types of electric lamp, it is difficult to obtain steady readings and correct candle power of lamps.

CORROSION OF METAL PIPES BY WATER.

During the year 1910, an investigation of the "red water" problem was begun in the laboratories of the Massachusetts State Board of Health, to determine to what extent various methods of water purification were responsible for such troubles, and to devise remedies if possible; and also to determine what effect variations in the composition of natural waters might have on iron and galvanized-iron, brass, copper, tin, and lead pipes. The experiments are not complete; but sufficient data have been obtained to indicate the effect of certain factors in the action of different classes of water upon pipes. Accordingly, Messrs. H. W. Clark and Stephen DeM. Gage have prepared a preliminary report which has lately been issued by the State Board; but it is pointed out that the results cannot be taken as completely representative of what might be obtained with other waters of the same general classes. The following epitome of the report appeared in a recent number of "Engineering Record."

The general method of making experiments is as follows: For tests with cold water, pipes 1 inch diameter and 30 feet long, with one coupling at the middle and two elbows, one at either end, are used. One elbow is fitted with a plug and the other with a 6-inch nipple closed by means of a cap. These pipes are laid with a slight pitch; the top of the plugged elbow and the top of the 6-inch nipple being on the same level. The pipes hold about 1½ gallons of water, and are filled and emptied through the short rising nipple at the lower end. When testing the action of hot water, pipes 1 inch diameter and about 6 feet long, capped at each end, are used; the pipes being laid directly on the top of a steam-boiler. The temperature of the water in the long pipes ranged from 50° to 70° Fahr.; while that of the water in the short pipes laid on the boiler ranged from 125° to 135° Fahr. The practice has been to empty and refill each pipe generally at intervals of seven days during the experiments when only comparisons of cold water were being made, and at intervals of three days when comparisons of both hot and cold water were in progress.

Relative Corrosion by Several Waters.—In this experiment, river water and the effluents from a mechanical filter, operated with the use of aluminium sulphate, and water from a pond and from a well supply, were allowed to remain in the pipes for periods of one week. In the town using the pond supply, more or less trouble was experienced with rusty water, particularly in houses having iron hot-water supply-pipes; while in the town using the well supply, there was some complaint of the corrosion of boiler-tubes. The individual results varied considerably from one another. The absorption of iron by the mechanically filtered water was always very much greater than that by any of the other waters; and the amount of iron absorbed by the effluent from the slow sand filter was usually slightly greater than that absorbed by the river water. Both the pond water and the well water were more corrosive than the river water or the effluent from the slow sand filter. The well water showed a somewhat greater absorption of iron than the pond supply experimented with.

Corrosion by Mechanically Filtered Waters.—In the previous experiments, it was found that mechanically filtered water was more corrosive than the same water before filtration or when purified by slow sand filtration. Experiments have also been made to determine to what extent the degree of alkalinity of mechanically filtered water governs its corrosive action, and if this corrosion can be lessened by increasing the alkalinity by the addition of soda-ash or of lime. In these experiments, both Merrimac river water and the water from a certain lake supply, concerning the purification of which by mechanical filters an application had

been made to the Board for advice, were studied. The raw waters were treated with sulphate of alumina in amounts sufficient to remove colouring matters (1·3 to 1·5 grains per gallon), and after standing until coagulation occurred (from three to eighteen hours, at different times) were filtered rapidly through a sand filter. Soda-ash or milk of lime was then added in amounts sufficient to produce the desired alkalinity; and the waters so prepared were placed in the pipes and allowed to remain for seven days. In general, the results of these experiments indicated that waters made alkaline with lime were slightly less corrosive than when the same amount of alkalinity was produced by the addition of soda-ash, and that there was a slight decrease in the corrosive action of the lime-treated water as its alkalinity or hardness was increased. This decrease was relatively small, however, unless its alkalinity was increased to such a point that the hardness would be noticeable to the consumer. An increase in alkalinity by the addition of soda-ash apparently had little effect upon the corrosive action of the waters. As in the preceding experiments, the mechanically filtered waters were much more corrosive than were the corresponding waters before treatment; the only exception being those to which an excessive amount of lime was added after filtration.

Effect of the Amount of Dissolved Oxygen.—In order to study the effect upon corrosion of the amount of dissolved oxygen in water, two sets of pipes, each consisting of a plain iron and a galvanized-iron pipe, were operated with distilled water containing different amounts of oxygen; the water being allowed to remain in the pipes seven days in each case. The distilled water used in filling one set of pipes was thoroughly aërated; while that used in filling the other set was blown out with steam to remove dissolved air, and cooled before use. Considerable difficulty was experienced in preventing the absorption of oxygen in this water during the operations of cooling and filling the pipes. After numerous experiments, the method of cooling the water and of filling the pipes under an atmosphere of illuminating gas was adopted as most successful. Usually the pipes could be completely filled in this manner with a water of low oxygen content, although it was seldom possible to have the water absolutely free from dissolved oxygen after placing it in the pipes. Determinations as to the dissolved oxygen in the water in each pipe were made immediately after filling, and after the seven-day period in each case.

The amount of oxygen in the water in each pipe fluctuated through considerable limits; but no regular relation was to be observed between the oxygen in the water and the iron dissolved by the water. The absorption of iron by the water originally of high oxygen content was much greater than that by the water of low oxygen content in both the plain iron and galvanized-iron pipes; and the absorption of iron from the latter pipes was very much less than from the plain iron pipes. The absorption of zinc from the galvanized pipes was practically the same with both the waters—averaging about 2·46 parts per 100,000 for the water high in oxygen, and 2·35 parts for that low in oxygen. In all cases the amount of dissolved oxygen in the water was very much reduced after standing seven days in the pipes.

The New "Notification" of the Gas Referees.

The "Notification" of the Metropolitan Gas Referees for the current year was issued on Friday. As in recent previous years, the chief alterations introduced since the immediately preceding issue are indicated by the use of italics. In Appendix L ("The Gas-Calorimeter"), there is an alteration at the top of p. 33. The sentence commencing the second line now runs as follows: "The thermometer used for finding the temperature of the effluent gas is held by a cork *carrying a helix of wire which rests on the lid so that the bulb is within one of the five holes, and is thereby exposed to the effluent gas.*" On p. 34, top line, there is an asterisk to the word "splashing," and the following footnote is given:—

> As damage to the outlet thermometer or the calorimeter has in some cases been caused by the turning-off of the water supply, it may be well to suggest a method of meeting this difficulty. The waste water from the change-over funnel may be led into a small vessel, from the bottom of which the water can escape, but at a rate less than that of supply. This vessel may be counterbalanced by a weight or spring, so that when empty it rises a small distance, and, acting as trigger, allows a weight to fall, or a wound-up alarum to ring –thus attracting the attention of the gas examiner.

In the directions as to the mode of testing for sulphur compounds other than sulphuretted hydrogen, it is intimated in the fourth line on p. 7 that the trumpet-tube is to be well washed out "with distilled water." The words quoted have been inserted. The regulations are to be in force from the beginning of this year until they are superseded.

Yorkshire Junior Gas Association.—We learn from the Hon. Secretary (Mr. E. Garsed, of Elland) that the next meeting of the Association will be held at the Halifax Gas-Works on Saturday when a paper will be read by Mr. J. Pyrah, the Lighting Superintendent of the Halifax Corporation, entitled "Some Notes on Street Lighting," accompanied by a demonstration with various types of street lanterns, burners, and other apparatus. Light tea will be served, provided by the President (Mr. C. D. Cawthra), after which he will deliver his address.

CORROSION OF THE COOLGARDIE STEEL WATER-WORKS CONDUIT.

It will probably be in the recollection of those of our readers who are connected with water undertakings that a few years ago a description was given in the "JOURNAL" of the great steel pipe-line, 350 miles long, laid at a cost of £2,500,000 to provide the district of the Coolgardie gold mines with water.* The pipes are 30 inches diameter; and they cross an arid, semi-desert region. The water they convey is taken from a dam on the River Helena; and it is distributed at the rate of 4 million gallons per day. The work was all completed in 1903. Subsequently, however, serious trouble arose from both internal and external corrosion of the pipes. Early in 1909, the Australian Government communicated with the Agent-General of the Colony in London, with the view of obtaining advice as to remedying the corrosion; and the late Dr. G. F. Deacon was appointed to proceed with the necessary inquiry. On his advice, Dr. Otto Hehner and Sir William Ramsay were associated with him. Owing, however, to the death of Dr. Deacon, the direction of the inquiry passed into the hands of Sir Alexander Binnie, who, with the collaboration of the gentlemen named, completed the work, and presented their report, the following particulars from which are translated from an article in the French publication "L'Eau."

The question may be regarded from the following points of view: External and internal corrosion, its causes, and the means of remedying them; the measures recommended; and an estimate of the costs of applying them. These several points are considered separately.

External Corrosion.—The two factors which have produced this appear to be the deterioration of the protective covering of the pipes, and the laying of them in ground always more or less charged with soluble salts. Having noticed, on the samples received by them, the partial and notable destruction of the coating, the Commission recommended that the pipes should be immersed in an asphaltic composition, nearly boiling, and immediately before being laid in Australia. There are two reasons for this recommendation: (1) If the pipes are treated just before being laid, the deterioration of the coating during the voyage or by exposure to the air is reduced to a minimum. (2) It has been found that a coating quite sound to the naked eye contains, when examined with the microscope, small holes due to minute air bubbles, which go right through the protecting coating. By applying a second coating at the moment of laying, the Commission estimate that the chances of the superposition of two air bubbles upon the two layers of coating would be very greatly reduced.

In order to protect the main in its present condition, the Commission propose, after scraping the coating of the bad pipes, the application of a mixture of bitumen and tar (the first process). Moreover, the main should, as far as practicable, be laid in open trenches. Where this is impossible, it should be covered with tarred jute (the second process). Finally, the Commission are of opinion that before closing the trenches a bed of concrete should be laid under the main, and the pipes covered again with a layer of slack lime about ½-inch thick (the third process). This would prevent any ulterior corrosive action in the case of the coating getting damaged, and moisture penetrating the pipe. The writer of the article in the French publication says this really seems to be an excess of precautions, which testify by their very abundance to the precariousness of the means proposed for protecting the steel from corrosion.

Internal Corrosion.—This was also caused by the disappearance of the protective coating; thus allowing a direct contact of the water with the steel, and causing the formation of certain nodulous incrustations in the thickness of the metal. The experts cannot believe, however, that these are the cause of the enormous loss of delivery that has been experienced. Evidently it is out of the question to think of re-coating the interior; therefore the Commission tried several experiments in order to render the water in the main absolutely innocuous as regards the steel. The composition of the water was not modified by its passage in the main. It was characterized by a very considerable strength of chloride of sodium and magnesium, and, on the other hand, weak in carbonates and free carbonic acid. With such water, an abnormal corrosive action on the metal was to be expected. Direct experiments showed, however, that in comparison with London water, which contains 8·9 parts of combined carbonic acid, the relative activity of Coolgardie water is only in the proportion of 1·38 : 1. The result of the experiments led the Commission to attribute to the oxygen in solution (which all waters contain) their corrosive action upon iron and steel, which are not constituted of pure metal, but contain in a state of combustion carbon, manganese, sulphur, and phosphorus. These elements not being uniformly distributed in the mass of metal, the latter may be considered as being formed of a large number of minute galvanic elements.

The following table gives the results of the experiments made for seven days in London with water from a street main and various samples of Kalgoorlie water upon the steel of the Coolgardie main. The water flowed on the steel in the daytime; not at night. Equal quantities were employed for each experiment. The result of the experiments and the theoretical considera-

* See Vol. LXXXIX., p. 293.

tions to be deduced from them was that if the oxygen contained in the water could be eliminated, corrosion would be arrested.

No. of Experiment.	Weight. Grammes.	Surface. Square Centimetres.	Loss of Weight. Milligrammes.	Loss per Cent. Milligrammes.
1	13·6750	13·08	22·5	1·72
2	26·0930	20·14	48·0	2·38
3	28·0830	22·41	3·3	0·15
4	29·3411	22·79	0·5	0·02
5	28·5822	22·44	1·2	0·05
6	23·3650	20·26	5·0	0·24
7	22·0885	22·29	4·0	0·18
8	24·2550	21·10	3·3	0·15

After examination, three methods were considered for protecting the pipes more or less effectually. The first consisted in removing the oxygen chemically by the addition of either sulphate of iron and alkali or carbonate of iron; in the latter case, filtering it afterwards on metallic iron. The second method consisted (without removing the oxygen) in reducing to a very large extent the attack of the iron on the water by means of the addition of caustic soda or lime wash. The third method proposed was to de-äerate the water by boiling. However, even by heating the water up to boiling point, it is not completely deprived of its oxygen. The advantage of this process is to avoid all addition of chemical reactives of which the consumers might complain; besides, it entails less expense than chemical treatment.

The final conclusion of the Commission, therefore, is that the most economical method for arresting corrosion would be to remove the air contained in the water by causing the latter to pass, in the form of rain *in vacuo*, and in adding about 45 grammes of lime per cubic metre; this quantity being reduced if a certain alkalinity was found in the water delivered to the consumers. In the report is described an apparatus designed for this treatment by vacuum and the addition of lime wash. It may happen that the water deprived of air becomes insipid, and that the oxide of iron contained in the parts of the pipe actually corroded does not dissolve—thus producing an unpleasant taste. In this case the air must be aërated, and the iron precipitated by passing the water in the form of rain into a coke-tower.

After having solved the problem of the elimination of the oxygen from the water, the experts went into the question of preventing the return of air into the main (for instance, at the pumping-stations). As a result, they recommend: (1) By the construction of various reservoirs to prevent the re-entrance of air. (2) The establishment of a compensating reservoir near Coolgardie, so as to provide for the seasonable fluctuations. (3) The installation, as near as possible to the River Helena reservoir, of an arrangement for de-aërating the water passing through the main, and for adding the lime. The cost of installation was estimated at 4,712,500 fr. (say, £188,500). The cost of the treatment of the water for a daily supply of 18,000 cubic metres (nearly 4 million gallons) would be £2800 per annum, of which £1200 would be for the de-aëration and £1600 for the treatment with lime.

From the perusal of the report, it is found that the protective measures taken against external corrosion are very complicated and uncertain as regards their effects; and that those taken against internal corrosion are no less complicated, onerous, and of equally doubtful efficiency, since de-aëration is not complete by the treatment of water *in vacuo*. Besides, in spite of the desire to avoid chemical reaction, lime water is added, of which it is necessary to correct the alkalinic action.

To sum up, the Coolgardie main, as constructed of steel pipes coated inside and outside, is found to be exposed to destruction from two general causes—one which relates to a difficulty of manufacture, and is the immediate cause; and the other which is incident to the nature of the water, and is the external cause. The former cause is that the protective coating of metallic mains is not impermeable but porous, and that its protection cannot be absolutely efficacious when the metal is itself easily subject to corrosion. The external cause is that the water, charged with oxygen in solution, attacks the steel pipes, the coating of which is not impermeable or has partly disappeared.

This example of the rapid destruction of a steel main, the cost of which was very heavy, is interesting, as showing the importance of the problems connected with the conveyance of water. The fact cannot be concealed that the measures put forward have, in reality, only for their object the prolongation—and to what extent?—of the existence of a canalization which has sustained considerable damage, and which, notwithstanding the £2,500,000 it has cost, shows the gravest signs of failure after an ephemeral existence of only six years. These results will certainly engage the attention of all whose duties are associated with the distribution of water.

Mr. F. H. Goodwin, the Chief Draughtsman at the Salford Gas-Works, having passed the necessary qualifying examinations in gas engineering and mechanical engineering, has been registered as a teacher in these subjects under the City and Guilds of London Institute.

During the past three months, the Road Board, with the approval of the Treasury, made grants to the amount of £33,787 from the road improvement fund to county councils and other highway authorities. They included £29,045 for the improvement of road crusts (including grants towards tar macadam, &c., and surface tarring). The total grants by the Board for this purpose up to Dec. 31 last amounted to £347,407.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Public Lighting of Rural Districts.

SIR,—I was interested in the description of the proceedings at Ashford (Middlesex) respecting the public lighting, having been, some three years ago, the prime mover—owing to no one else having the courage to take the initiative—in a similar matter at Knowle, near Birmingham. The place had been unlighted ever since its creation; and the opposition was of a similar character to that at Ashford; only a handful of people being opposed to it, and they being those who could ride in motors, &c. But the voice of the people prevailed; and to-day Knowle is lighted to the satisfaction—strange to say—of those who were greatest in opposition.

My chief object in writing to you is to point out an error in the report. It is only necessary to wait one year (not five years) before trying again. Section 16 of the Act of 1833 is quite clear on the point. The movers in the matter can therefore try again at no distant date.

There is another way by which they can proceed in the event of future failure. They can petition the Rural District Council to adopt the portion of the Public Health Act, 1875, which gives urban powers through the Local Government Board in the matter of public lighting. The Rural Council can then light the district. This would have been done at Knowle had the opposition not faded away.

I may add that I pointed out to the Local Government Board that the Act of 1833 was practically obsolete, and received an acknowledgment.

Gas-Works, Knowle, Jan. 8, 1912. F. J. WARD.

[It will be apparent, from the date of our correspondent's letter, that he had not seen the correction, in the last number of the "JOURNAL," of the error to which he directs attention in the second paragraph. —ED. J.G.L.]

Specific Gravity Indicator.

[TRANSLATION.]

SIR,—I have noticed, with much interest, in the number of the "JOURNAL" for the 2nd inst., that the firm of Alexander Wright and Co., Limited, are now making my gas-balance to record, which I had already done twenty-five years ago. I did not, however, then manufacture the apparatus in the ordinary course, as people could not at that time have been expected to take trouble over the washing and fixing of the sensitized paper. At the present day, when it may be said that everyone takes photographs, all this has been entirely changed.

There is, however, still the objection to the apparatus of Messrs. Alexander Wright and Co., that with change of temperature and atmospheric pressure a correction of the graphic record would still be necessary. This correction, however, cannot be made, because the temperature and atmospheric pressure which prevail at the different times are not known.

This objection can, however, easily be overcome by attaching to the other side of the balance beam a completely closed metal sphere, of which the capacity and distance from the pivot are so proportioned that for a certain mean specific gravity—say, ·4—it almost nullifies the effect of temperature and atmospheric pressure.

I should be glad if you would find space for the above lines in your esteemed "JOURNAL."

Ludwigshafen-on-the-Rhine, Jan. 9, 1912. FRIEDRICH LUX.

[Herr Lux has evidently misunderstood the reference to Messrs. Alexander Wright and Co. in the opening paragraph of the article by Mr. D. Chandler in the "JOURNAL" for the 2nd inst. (p. 26). The arrangement described by Mr. Chandler for rendering the "Lux" specific gravity balance recording is one which has been made, after experiments, by the South Metropolitan Gas Company. The automatic continuous indicator of specific gravity which Messrs. Alexander Wright and Co. now make is not an adaptation of the "Lux" gas-balance, as will be realized from the description and illustration of it in the "JOURNAL" for the 19th ult. (p. 817).—ED. J.G.L.]

Technical Assistants' Pay.

SIR,—I am extremely gratified to see you are still continuing your previous efforts to assist the body of much underpaid technical assistants to obtain better conditions of service. I am afraid they have themselves, to some extent, created this lamentable state by a too apathetic attitude towards their employers on this question, and too great a readiness to take anything and everything at any price offered, on the sporting chance that it may improve later. Now that the Junior Associations have become a power in the land, surely the Joint Councils could not do better than formulate some scheme to induce their members to refrain from making applications for posts to which only a miserable pittance is attached, when the lack of supply would create a better demand. This may savour to some of the methods of Trade Unionism; but it has its points.

I think the Technical Press could also assist by refusing to insert advertisements for assistants at these inadequate salaries under a number, and so compel the advertiser to announce himself. I am moved to this suggestion by an advertisement appearing in your contemporary's issue of yesterday, and which will probably be appearing in the "JOURNAL."* It is nothing less than a studied insult to offer an assistant for a 300 to 400 millions' works £2 per week! who is also, be it noted, expected to be an expert draughtsman for the same munificent

* The advertisement referred to will be found on another page of this issue.—ED. J.G.L.

salary. It is scandalous to offer this wage even to a draughtsman who is worth his salt. Stokers and bricksetters get more; but to a qualified assistant, who has spent years of his life in training for such a post, it is a personal insult. I trust, should you receive the same advertisement, that you will force the advertiser to come out into the open, so that we may know him.

Jan. 12, 1912. CHIEF ASSISTANT ENGINEER.

LEGAL INTELLIGENCE.

DAMAGE TO ROADS THROUGH MAIN-LAYING.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Friday, Jan. 12.

(*Before the* LORD CHIEF JUSTICE *and Justices* PICKFORD *and* AVORY.)

Mayor and Corporation of Swansea v. Harpur.

This was a case stated by the Justices of the Peace for the Petty Sessional Division of Ystradgynlais for the opinion of the High Court.

On June 20, 1911, a complaint was preferred by the Surveyor of the County Council of Brecon against the appellants (the local authority for the district of the county borough of Swansea), under section 2 of the Swansea Corporation Water-Works Acts, 1905, which incorporates section 28 of the Water-Works Clauses Act, 1847, for having on Dec. 16, 1910, damaged a road so as to cause a portion to give way and fall into the adjoining river. At the hearing it was proved that, under the Act of 1908, the appellants laid in a highway in Brecon a pipe 24 inches in diameter, which was repairable by the respondents, to carry water from their reservoir at Cray to Morriston. Eight months after the pipe was laid, a portion of the highway and the river bank supporting it to the extent of a distance of 50 feet, slipped into the river. The work of cutting the trench and laying the pipe was carried out, in accordance with deposited parliamentary plans, in a proper, efficient, and workmanlike manner, after notice had been served upon the respondents, who made no objection to the position of the pipe. After it was laid, the trench was filled and rammed, and the road restored to its original condition. Respondents contended before the Justices that the damage done to the road was due to the laying by the appellants of a line of pipe, and that the respondents were entitled to be paid compensation for the damage done under section 28 of the Water-Works Clauses Act. For the appellants it was contended that the damage, even if caused by their operations, was not within the section cited, and that, even if compensation were payable under it, section 85 of the Act, dealing with the recovery of damages not specially provided for, did not empower the recovery of compensation, and also that such section, incorporating section 140 of the Railway Clauses Consolidation Act, 1845, did not give the Justices jurisdiction to deal with the complaint. The Justices found that the damage to the highway and the river bank was the result of the appellants laying the pipe in the roadway, and that the claim was properly made; and they ordered them to refund to the respondents the amount paid for the repairs—viz., £87 10s.—and costs. The question for the Court was whether, upon the foregoing facts, the damage, even if caused by the appellants' operations, came within section 28; and, if so, whether this section empowered the respondents to recover "compensation" in respect of the damage, such damage not being damages "not specially provided for," and whether section 85 gave jurisdiction to the Justices to deal with the complaint.

Mr. MACMORRAN, K.C., and Mr. T. CUTHBERTSON appeared for the appellants; Mr. SANKEY, K.C., and Mr. HAROLD STOWE represented the respondents.

The LORD CHIEF JUSTICE said it was quite impossible to decide this case by trying to draw a distinction between "compensation" and a claim for damages. One must look more broadly at what the scheme of construction of the Act was. Section 28 did not contemplate anything being paid except where damage had been done in the execution of the powers granted, and then "compensation" had to be paid for it. The word "compensation" was used to express repayment for the damage so occasioned. This view was confirmed by considering the remaining sections down to section 34. Supposing the Road Surveyor had foreseen that the bank would come down, and had asked the Corporation to put up a wall which they had refused to do, he might himself have done the work, and recovered the cost under section 34. This would not be "compensation," in the ordinary sense of the word. The case was one in which the recovery of damages was not specially provided for, and therefore fell under section 28. The cost of making good the damage to the road was a repayment of something which the road authority had to expend because it was damage done as the result of appellants laying the pipe in the road.

Mr. Justice PICKFORD and Mr. Justice AVORY concurred; and the appeal was dismissed, with costs.

Leave to appeal was granted.

GAS-MANTLE SALES UNDER A FORGED TRADE MARK.

At the Old Street Police Court, last Wednesday, before Mr. H. C. BIRON, Joseph Weinbaum, of 22, Nicholas Street, Mile End, appeared in answer to a summons taken out by the Wholesale Fittings Company, of Commercial Street, E., for applying a false trade description—*i.e.*, the word "Olympic"—to certain gas-mantles, within the meaning of the Merchandise Marks Act, 1887; and also a second summons for unlawfully selling these mantles.

Mr. E. J. TRISTRAM (Messrs. Halse, Tristram, and Co.) appeared in support of the summons; Mr. CURTIS BENNETT (instructed by Messrs. Bryson and Wells) represented the defendant.

Mr. TRISTRAM, in opening the case, said the plaintiffs applied the word "Olympic" to both the upright and inverted gas-mantles made by them. In 1909, the output was only about 75 gross; but it had since increased to 2280 gross. In August last, a number of "Olympic" mantles were sold to the defendant; and since then the sales by the plaintiffs had fallen off considerably. On the 2nd inst., some mantles were purchased from him; and they were identical in appearance with those made by the plaintiffs. [An original and an imitation mantle were shown.] The box in which the mantles were sold was similar, both in colouring and shape, to the "Olympic" box, and the printed matter was the same. On the defendant's premises were found 60 gross of upright and 34 gross of inverted mantles, valued at between £50 and £75; and the plaintiffs submitted that if these inferior mantles had been placed on the market, their trade would necessarily have been seriously affected.

Mr. CURTIS BENNETT said he must plead "Guilty;" but on behalf of the defendant, he must say he had no idea he was dealing in things which were already registered. He had purchased some "Olympic" mantles from the plaintiffs; and subsequently he was called upon, in the ordinary way of trade, by a man named Stammerick, from Berlin, who told him he could make gas-mantles. Defendant asked him whether he could make something similar to the "Olympic" mantle; and he suggested some other name. Stammerick replied that the word "Olympic" was not registered as a trade mark; and defendant, taking his word, placed an order with him, and in due course received a large quantity of mantles towards the end of November last. About that time some were purchased for the plaintiffs; and a summons was served on the defendant on the 2nd inst. He was asked as to where he had obtained the mantles, and he gave what information was in his power.

Mr. BIRON remarked that the matter was rather like one of false pretences. Obviously the "get up" of the imitation mantle was a direct copy of the original.

Mr. CURTIS BENNETT said the defendant understood that the maker of the "Olympic" mantles manufactured them in Berlin, and that he was only buying from the same source as the plaintiffs. The difference in price—only 2s. 6d. per gross—would lead him to that conclusion. He would ask for a small penalty. The Magistrate had power, under the Act, to order the articles in question to be destroyed, or dealt with as he thought fit. Defendant had purchased them to the amount of £50 or £70; and if an order for their destruction were made, the penalty would be out of proportion to the offence. It would mean absolute ruin to the defendant. He thought that if he handed over the mantles to plaintiffs it would be the most severe penalty that could be imposed. They would be very useful to them as they had the name &c., already on them.

Mr. BIRON: Are there any more of these mantles about?

Mr. TRISTRAM: Yes. We have found that there are about 10 gross, and they have damaged the reputation of our firm. There is also another mantle which has been put up by another firm, in which our colouring has been copied.

A penalty of £20, with £10 10s. costs, was imposed on the second summons; and an order was made for the mantles in defendant's possession to be destroyed. The first summons was withdrawn.

Wakefield Corporation and the Gas-Works.

It was recorded in the "JOURNAL" last week that the Wakefield Corporation had referred to the Law and Parliamentary Committee the question of the position of the Corporation in regard to the Bill of which notice has been given by the Gas Company, and had sanctioned the obtaining of expert or other evidence to assist them in the matter, in view of the suggested acquisition of the Company's undertaking. The question has been reviewed at some length in the local paper by Mr. England, the Chairman of the Electricity Committee of the Corporation. He considers that any proposal of the kind would, if adopted, be a grievous burden to the ratepayers; and therefore he will oppose it to the utmost of his power. He says: "We all believe the Gas Company is well and efficiently managed; that they leave no stone unturned to secure business; and that whenever there is an opening for lighting, cooking, heating, or power, the Company strains every nerve to get the business. This is an important fact to be considered when deciding upon the likelihood of the Corporation being able to purchase the Gas Company, and make the business profitable afterwards." Having dealt in some detail with the financial aspect of the question, Mr. England refers to the action of Parliament in the Salford case, in which the principle was laid down that a corporation should not make a profit of more than 1 per cent. on the outstanding capital, after providing for capital charges and depreciation. In view of this, he considers it is ridiculous for a local authority to saddle themselves with great responsibilities, take enormous risks, and in the end find they are supplying a large gas area, and, at the best, only benefiting their own ratepayers to the extent of a paltry 1 per cent. on their outstanding capital. In his opinion, as a business proposition this will not bear investigation.

Gas Lighting at the Park Hall, Cardiff.—In the "Electricity Supply Memoranda" last week, comment was made upon some absurd statements by the "Man about Town," in the "South Wales Echo," on the lighting of the Park Hall at Cardiff. It may be remembered that it was stated that with gas lighting the air of the hall was "hot, foul, dry, and poisonous;" whereas since the place had been "illuminated by electric glow lamps" there had been a difference. It appears that, so far from electricity having replaced gas lighting, the management have installed nine new high-pressure inverted burners, having an illuminating power of 13,000 candles; and at a recent concert, remarks were made on all sides regarding the soft and radiant illumination of the hall, which is one of the largest halls in Wales. The lamps gave a brilliant and well-diffused light without shadows—a better light than was ever obtained previously, and with a smaller consumption of gas, and therefore less cost. The system of lighting is the same as that which the Cardiff Gas Company are employing for shop and street lighting; and it is one for which the Company are receiving much praise.

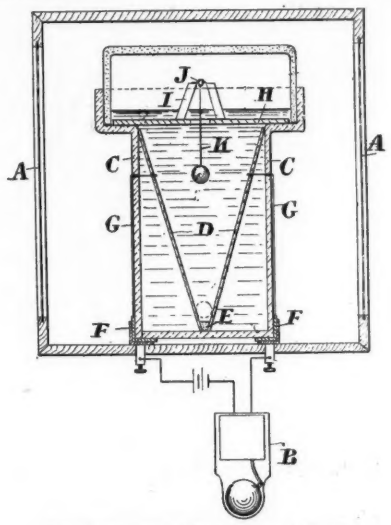
REGISTER OF PATENTS.

Alarm Apparatus for Detecting Escapes of Gas.

PAUSINGER, F. VON, of Carinthia, Austria.

No. 28,697; Dec. 9, 1910. Date claimed under International Convention, Dec. 9, 1909.

This invention is a modification of patent No. 774 of 1910—an alarm apparatus for preventing explosions and poisoning by gases, in which a circuit is held open against the action of a spring or weight by a thread which carries a pill of spongy platinum and is made of easily fusible material (such as Wood's alloy), so that no spark is formed by the melting of the thread.



Von Pausinger's Gas-Escape Alarm.

The casing (as shown) has in each side wall a wire gauze window A. In front is a glass door. Two metal guide-bars on the bottom of the casing are provided with terminals connected with the ends of a wire in which an electric alarm B or signal lamp is arranged. Between the guide-bars is a rectangular glass vessel C abruptly expanding at the top. Two metal plates D, sloping towards each other in the vessel, are separated at the bottom by a bar E of insulating material. On the outside of the glass vessel, at its angle edges, angle-shaped metal bars F are connected with the corresponding plates D by wires G passing through the walls of the glass vessel, whereby the current is enabled to flow to the plates, which form contact parts. On the expanded portion of the glass vessel a plate rests, and carries the fusible thread or wire provided with a pill of spongy platinum.

According to the present arrangement, in order to prevent any loss of heat, the fusible thread or wire is made as short as possible; and for this reason the supports I holding the wire are arranged as closely together as possible, or (as shown) are sloped upwardly towards each other. Both the supports are grooved at the top, and in the grooves is cemented the thread of fusible material (such as Wood's alloy) and provided with a pill of spongy platinum or other catalytic substance J—*i.e.*, a substance heated by the absorption of the gas. A thread of silk or other bad heat-conducting material passes from the pill; and to the thread is connected a wire K, which at its lower end carries a ball suspended between the metal plates D. The vessel C is filled to a level above the plate H with (say) water, and is closed by a lid of earthenware.

If gas passes to the pill of spongy platinum, and, owing to its heating, fuses the thread, the wire K, together with the pill and ball, will fall down and rest between the metal plates D, whereby the electric bell-circuit is closed. The falling pill is immediately extinguished by the liquid, and the contact is formed in the liquid; so that the formation of any spark is avoided or danger of explosion is prevented.

Radiators Heated by Gas.

PULSFORD, F. C., and NESBIT, D. M., of Leicester.

No. 30,228; Dec. 29, 1910.

This invention relates to radiators that generate their own heats—such, for example, as steam, water, and hot-air radiators heated by gas or equivalent means. It is particularly applicable to self-heating radiators, wherein steam is generated from an enclosed quantity of water by means of a bunsen or white-gas burner; the gas supply being automatically regulated by the pressure or temperature of the steam generated, or by the temperature of the surrounding air of the room. Such a radiator may also be adapted to heat up the surrounding air by means of an internal air flue or pipe; and the products of combustion from the gas-burner are passed through an open flue or passage to a chimney.

The object aimed at is to improve a radiator of this kind so as (*a*) to bring about a quicker and more complete vaporization of the water in order that the radiator will throw out heat in less time after lighting, (*b*) to provide a more positive automatic regulation of the gas supply according to the heat of the radiator, and (*c*) to generally increase the efficiency of apparatus of the type in question.

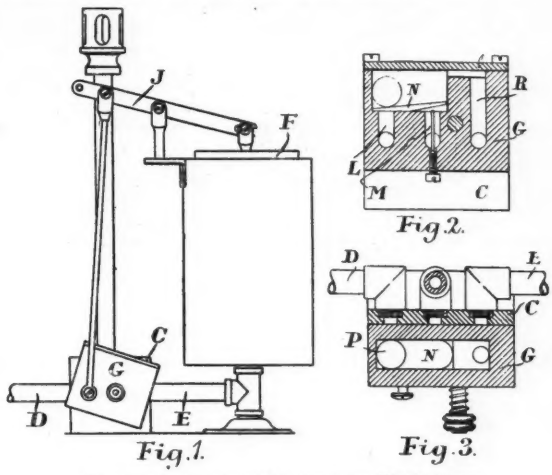
The apparatus comprises a boiler and a number of radiator sections or columns; the boiler being either at one end of the radiator sections or in the centre. The radiator columns are of the usual form; the important feature claimed for the invention being the improvements in the boiler and gas regulation, which are described in connection with seven sheets of illustrations.

Gas-Lighted Flash-Signs for Advertising Purposes.

JACKSON, T., of New Cross, S.E.

No. 29,977; Dec. 24, 1910.

This is an improvement on patent No. 4438 of 1910; so as to provide more reliable means for controlling the distribution of gas by the tiltable controlling device there described, in order that the control can be effected by a less angular movement than before.



Jackson's Gas-Lighted Advertising Flash-Signs.

Fig. 1 is a front elevation of the flash-light apparatus. Fig. 2 is a vertical section of the valve-box. Fig. 3 is a horizontal section.

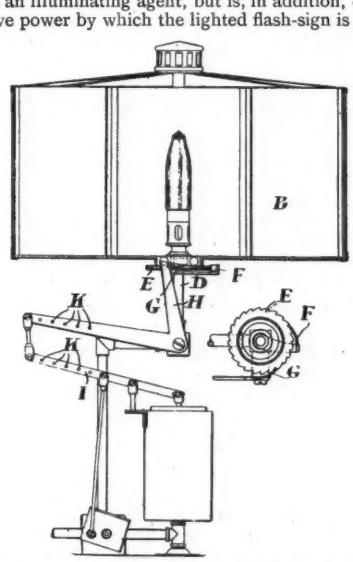
The burner is mounted on a pipe attached to the valve-seating C, from which another pipe D leads to the gas supply, and the pipe E to the reciprocating bell F. On the face of C is the valve-box G, connected by a rod with a pivoted lever J connected to the bell. In G is a flat seating in which orifices L M are arranged. The former leads to the gas-supply port in the valve-seating, and the latter to the port leading to the burner. Upon the seating is arranged a double valve N, having facets at an angle to one another and a knife edge about which the valve can rock, so as to close and open the orifices L or M alternately. On N is mounted a ball, which is constrained by the walls of the valve-box to roll only in a straight line along the valve; so that as the valve-box G is tilted from side to side by the bell the ball opens and closes the orifices L and M alternately. A bye-pass is provided in G which prevents the valve N from completely closing the orifice M. A third orifice R communicates with the port for connecting the upper side of the valve N with the bell.

Gas-Lighted Flash-Signs for Advertising Purposes.

JACKSON, T., of New Cross, S.E., and RAMSAY, A., of Folkestone.

No. 29,978; Dec. 24, 1910.

This invention relates to means whereby the motive power of the gas is not only utilized to work the mechanism for producing an intermittent supply as an illuminating agent, but is, in addition, caused to provide the motive power by which the lighted flash-sign is moved.



Jackson and Ramsay's Gas-Lighted Flash-Signs.

A view is given of the complete apparatus, with a plan of the ratchet-wheel, the operating lever and pawl, and the retaining pawl.

The flash-light device is similar to that described in patent No. 4438

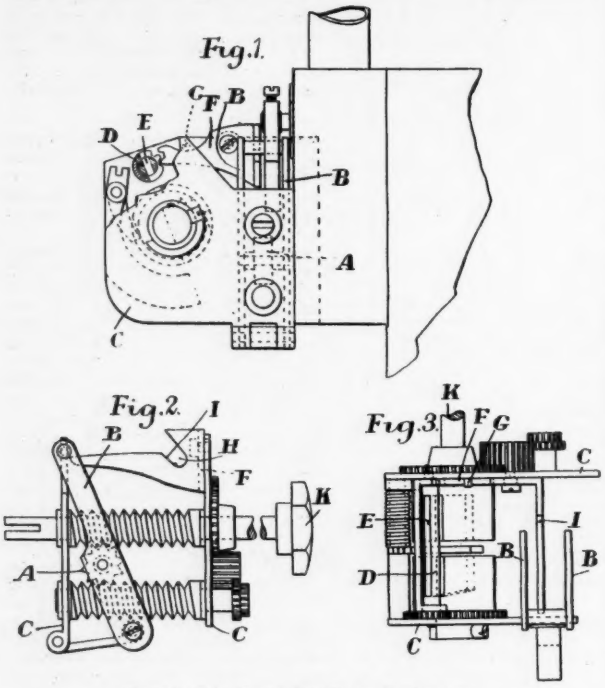
of 1910. The lantern B is pivotally mounted on the gas-standard D. The lower part of it fixedly carries a ratchet-wheel E, with which engages a retaining pawl F, mounted on the standard (to prevent backward motion), and an operating spring pawl G mounted on the end of the bell crank H. The lever I is connected to H by a connecting rod, and a series of holes K are provided in both the bell crank and lever to vary the leverage and the consequent motion from it. As the mechanism is operated by the gas, the lantern is revolved by a step-by-step motion, and the revolution continues so long as gas is being used.

Coin-Freed Mechanism for Gas-Meters.

GLOVER, T., of Edmonton.

No. 4900; Feb. 27, 1911.

This invention relates to coin-freed meters in which two worms are employed with a pinion travelling to-and-fro between them; the pinion being connected by a rod to the valve controlling the supply of gas as described in patent No. 22,830 of 1894, and also to that class of coin-freed mechanism in which a slotted roller is in gear with, and lies parallel to, the coin-receiver—for preventing surreptitious interference with the mechanism—as patent No. 6373 of 1910. The object is to provide mechanism whereby, in addition to the objects set forth in the 1910 patent, a closing of the coin-slot is effected after a full supply of coins has been inserted and the mechanism operated by the handle to the fullest extent "whereby such mechanism is prevented being strained by inserting more coins than required and then operating the handle."



Glover's Coin-Freed Gas-Meter Mechanism.

Fig. 1 is a side elevation (partly in section) of the mechanism. Fig. 2 is a side elevation of the operating levers, worms, and pinion (at right angles to fig. 1). Fig. 3 is a plan of the mechanism, with the pinion and worms removed for the sake of clearness.

The pinion A (situate and travelling between two worms), upon a lever B, is pivoted to a link on the frame C; and to the free end of the lever is connected the rod for operating the valve. The lever consists of two members, with the pinion A between them—being kept at their proper distances apart by rods or pins. Around the slotted roller D, and on it or its axle, is pivoted a curved or channelled cover, one end having teeth which mesh with teeth on one end of a rocking lever F pivoted to the frame; the other end of the rocking lever being provided with a long arm which is positioned under one of the rods of the lever B carrying the pinion A. The lever F is also provided with an angled piece against which one of the rods of the lever B has action to move the rocking lever F and, through teeth, revolve the cover to close the coin-slot E.

In action, the pinion lever B is at one end of its stroke, as in fig. 2—the long arm of the rocking lever being engaged with it and the rocking lever engaging the stop G on the frame to keep the coin-slot open. A coin is now dropped in the slot, and the mechanism actuated by the usual handle K—this movement (through suitable gearing) revolving one of the worms which move the pinion A. This carries the lever B over; the operation being continued until the full number of coins have been inserted—the lever during these movements always engaging the long arm of the rocking lever F. But on the insertion of the last coin, the pinion lever B will have moved nearly its full distance, and it (or a pin on its end) will come into contact with an angled surface on the rocking lever, and, riding against it, will lift that end of the rocking lever and cause it to move; the teeth on the other end revolving the curved cover and closing the coin-slot E in the roller D—the long arm being recessed or bent (as at H) at the end to allow of this movement of the rocking lever. During this movement, the lever B has opened the gas-valve through a rod, or by any suitable appliance in any well-known manner.

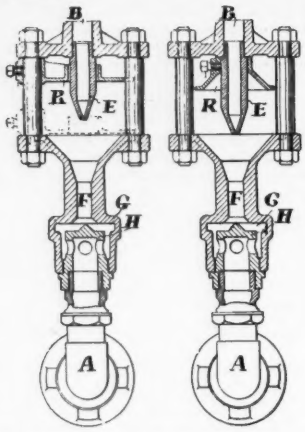
The gas mechanism now commences to reverse the movement of the pinion lever B by operating the other worm, when the pinion lever will act on the incline I leading to the long arm and move the rocking lever F in the other direction—revolving the cover and uncovering the coin-slot E. During the return movement of the pinion lever, the long arm will be engaged by the pinion lever B and keep the coin-slot open, and at the end of the movement of the lever the gas-valve will in consequence be closed.

Gas-Burners Applicable for Melting Furnaces.

BRAYSHAW, E. R., of Hulme, Manchester.

No. 5931; March 9, 1911.

This is a modification of the gas-burner described in patent No. 11,117 of 1910—to adapt it for use with high-pressure gas and air at normal or atmospheric pressure.



Brayshaw's High-Pressure Burner for Melting Furnaces.

The burner is constructed with a passage F into which the gas and air are delivered, a mixing-chamber G, a baffle H, and holes or passages through which the mixed gases flow to the outlet pipe A of the burner.

The gas-inlet pipe B is fitted with a nozzle E, through which the supply of gas issues, and the passage F is formed with an open or flaring air inlet to allow the air supply to be drawn in by the gas-jet issuing from the nozzle E. The supply of air is regulated by a regulating plate R placed over the nozzle and fitted on either a pillar or on a nozzle. The regulator R may be adjusted to or from the air inlet, to admit a greater or less quantity of air according to the pressure or velocity or volume or weight of gas jet issuing from the nozzle E.

The outlet pipe A is fitted into the furnace as described in the 1910 patent.

Treating House Refuse for the Production of Gases.

BIRAULT, C., of Paris, and RICHÉ, H., of Lisors, France.

No. 9550; April 19, 1911. Date claimed under International Convention, April 30, 1910.

This invention relates to apparatus for treating picked or unpicked house refuse with the object of obtaining from it combustible or fuel gas and eventually of utilizing the bye-products and residues.

The process consists, as a principle, in placing the house refuse in direct contact with dry fuel in an incandescent state, while both the charge and the dry fuel are supplied with air separately in regulated quantities. The gas produced from the refuse thus treated is collected—its production being facilitated, if necessary, by agitating the hardened material lying on the vibrating grate; and the gases are then passed through another charge of fresh refuse, "this having the effect of enriching the gases by the distillation or the carbonization of the second charge of material."

The apparatus used consists of two chambers which may be either juxtaposed or superimposed, and in any case are so placed that the gases leaving the first chamber penetrate into the second chamber through the lower part of the latter, after having passed over a free space or ashpit, the upper part or cover of which consists of a perforated bottom forming a grate (either fixed or movable) adapted to support the second charge of refuse through which the gases pass and carbonize or cause it to be distilled—the latter being thereby enriched before leaving the apparatus.

Lamplighters' Wages at Plymouth.—In the course of a discussion on the wages of municipal employees at the meeting of the Plymouth Town Council yesterday week, the suggestion was made that the pay of the lamplighters should be increased. Mr. Merrett said the men had 22s. a week and asked for 22s. 6d. Alderman Phillips said the lamplighters worked 80 minutes in the morning and for a similar time in the evening, and cleaned their lamps once a week, which was equal to eight hours' work. They had a whole week's holiday once a year, because they could not have the ordinary holidays as the lamps had to be lighted whatever the day. He considered that these conditions were handsome, and that the men were better paid than any others in the employ of the Corporation for the work they did. The Committee did not think they would be justified in altering the present rate of 22s. a week with sick pay. The Council decided not to grant the increase asked for.

MISCELLANEOUS NEWS.

SULPHATE OF AMMONIA MARKET.

Messrs. Bradbury and Hirsch's Review for the Past Year.

There is necessarily a great deal that is of interest to the gas industry in the "Review of the Market for Sulphate of Ammonia," which is prepared annually by Messrs. Bradbury and Hirsch, of Liverpool. A copy of the issue for 1911 is now before us; and from it the following particulars have been taken.

Though, owing to the decline in the prices of sugar and cereals, Messrs. Bradbury and Hirsch were unable, when they wrote their last "Review," to look forward to an expansion in the fertilizer trade in 1911 such as had been experienced in 1910, they were of opinion that the 1910 record demand might at least be counted upon. The review of the trade in 1911 shows that these apprehensions were justified; for while there has in all departments been some increase in bulk, it has not been on anything like the scale of the increase in 1910. But there has been a steady, and in some departments a decided, improvement in values, and in respect of values the year's working shows a substantial improvement upon that in the preceding year. They do not think that the outlook for 1912 should be discouraging, though it will be entered upon with a higher level of prices than has been seen for many years. It is, they say, true that, owing to a huge cotton crop, there has for some months past been a shrinkage in demand for nitrogenous fertilizers in the United States; but they think that elsewhere the inducements to the cultivation of record crops of beet and sugar cane will more than counterbalance any shrinkage in United States demand. Given reasonable prudence in the handling of supplies, they do not see why the present level of prices should not be maintained over the coming season.

Nitrate of Soda.

Discussing first of all nitrate of soda, Messrs. Bradbury and Hirsch remark that, though at the end of 1910 they were aware that stocks on the West Coast were some 85,000 tons larger than those at the end of 1909, it did not seem to them that there was anything in the then free alongside price to induce any special effort on the part of producers to bring their stocks into narrower compass; and they had specially in view the fact that the December, 1910, shipments showed a decline of over 30 per cent. upon those made in November and in October. They are afraid that their eyes were too intent upon the probable action of producers, and that they paid too little attention to the probable policy of speculative merchants. Compared with other years, exceptionally heavy shipments were made early in the year. Those interested no doubt so timed their shipments in order that they might avail themselves of the spring demand in Europe; but the effect was to very largely increase the actual supply for January-April, and the firm's estimate was consequently much below the mark. The actual supply for January-April proved to be 1,171,000 tons, or 36,000 tons more than that for January-April, 1910. Deliveries from the United Kingdom and Continental ports were 1,002,000 tons; and stocks at these ports on April 30 were 169,000 tons. A year ago, Messrs. Bradbury and Hirsch were of opinion that the then prospective supply would find a sufficient market, and at hardening prices, given favourable weather conditions; but they were not, for reasons which they gave at some length, very sanguine about much increase in consumption. Though the weather was not unfavourable, there was a falling off in deliveries to the extent of 50,000 tons up to the end of February. In March, however, the January-February shrinkage was reduced by 33,000 tons, and in April by a further 12,000 tons; but it was not until May that deliveries in 1911 overstepped those in 1910. Deliveries from the ports from January to May were 1,198,000 tons, against 1,165,000 tons from January to May, 1910. So that their views in respect of consumption, the firm point out, were not very far astray. As a matter of fact, the 1910 spring season was exceptionally early; and consequently the heavy deliveries commenced earlier than in the average of years—1911 included.

The market was firm from the outset; and though within the month visible supply, in relation to that in 1910, had substantially increased, sellers were able in January to advance their price from 9s. 6d. to 9s. 7½d. per cwt. Deliveries were about the same as in January, 1910. Visible supply and stocks at the ports at the end of January being still considerably less than at the corresponding period in 1910, sellers were able to force the price up to 9s. 10½d. per cwt. in the second half of February; but almost immediately there was a decline to 9s. 9d. per cwt. In March, when it was seen that deliveries in February had gone back some 50,000 tons, and that by reason of this and of the heavy shipments in January and February the visible supply, which at the beginning of the year showed a shrinkage of 48,000 tons upon 1910, at the end of February exhibited an increase on 1910 of no less than 80,000 tons, there was a decline to 9s. 7½d. per cwt., though demand was unprecedentedly heavy. The actual deliveries from the ports in March were no less than 368,000 tons—the record in any one month in the history of the trade, and 32,000 tons in excess of the deliveries in March, 1910. By reason of a very marked falling off in shipments in March, and of continued heavy deliveries in April, supply and demand were fast being adjusted; and the price was advanced to 9s. 9d. per cwt. Sellers, however, were rather pressing; and there was no further advance in April. In May, the statistical position having further improved, and demand being particularly good, 10s. per cwt. was realized about the middle of the month; and this price was maintained up to the close. In June, up to 10s. 1½d. per cwt., was paid; but there was a decline to 9s. 10½d. in the second half of the month. During the latter half of the year, though the visible supply was very much larger than during the corresponding period of 1910, prices were wonderfully well maintained; the fluctuations from July to September being between 9s. 10½d. and 10s. per cwt. At the end of September the visible supply was 147,000 tons ahead of that at the end of September, 1910. Since the beginning of October, the price has fluctuated between 10s. and 10s. 1½d. per cwt.; and the closing price for the year was 10s. per cwt., in spite of the fact that visible supply was still 87,000 tons ahead of that at the end of 1910.

Production during the year is, say Messrs. Bradbury and Hirsch, estimated to have been 2,470,000 tons, against 2,420,000 tons in 1910. The policy of producers has been exactly the same as in 1910. There has been no attempt at combination for the purpose of reducing output or in regard to prices. Each producer has turned out the utmost possible; and, notwithstanding the higher level of prices ruling compared with 1910, there has been no resumption of operations on the part of the concerns which were obliged to close down in 1909 and 1910. Prices have been regulated by the extent of demand for the time being—demand representing the opinion of speculative merchants as to the world's requirements, which opinion may have been right or may have been at fault. The 1912 campaign is being entered upon without any change of attitude on the part of producers. "Obviously," they add, "it is going to be a fight till the world's requirements overtake the capacity to produce—a consummation almost within sight, we think."

The visible supply (stock and afloat) for the United Kingdom and the Continent at the end of 1911 was about 1,046,000 tons, compared with 959,000 tons at the close of 1910, and 1,007,000 tons on Dec. 31, 1909. The visible supply is thus 87,000 tons larger now than it was at the end of 1910; while stocks on the West Coast are about on a level with those of a year ago. Assuming that of the 1912 shipments 225,000 tons will arrive before the end of April, and adding to this the present visible supply of 1,046,000 tons, there will be an actual supply of 1,271,000 tons for January-April—or 100,000 tons more than for the same period of 1911. Inasmuch as, though the spot price is now about 6d. per cwt. more than a year ago, the advance has been far less than that of any other nitrogenous fertilizer, the reviewers point out that nitrate of soda is relatively cheaper than it was twelve months ago; and on this account there ought to be a further reversion to the use of it. In view of the beet sugar position, and assuming a fairly early season, they do not think that the supply of nitrate of soda will prove to be too much.

Sulphate of Ammonia.

On the subject of sulphate of ammonia, Messrs. Bradbury and Hirsch remark that in their 1910 "Review," when discussing the then situation and the prospects of the market for the ensuing months, they were confronted by several puzzling factors. The most important feature in the market during the preceding six months had been the enormous demand for the United States, whereby, more than anything else, prices had been materially advanced. Shipments to the United States, July to December, had, in fact, more than doubled; and it was doubted whether the pace would last. It was known that production in Germany had very largely increased within the year; and this fact was emphasized by a shrinkage in German imports from the United Kingdom, July to December, of no less than 13,000 tons, and by the greater activity of Germany in foreign markets. There had been a very marked falling off in Japanese demand; and it was not certain that this would be made good in the early months of the new year. It was stated that, owing to the huge crop of beet sugar, and the consequent slump in prices, there would not be much inducement to aim at another record crop, and that a serious falling off in the use of fertilizers for sugar growing must be counted upon. It was also said that, owing to relative cheapness, nitrate of soda would be largely substituted for sulphate of ammonia in all beet-growing countries. The reviewers were not too much impressed by all this. They were not disposed to attach too much importance to the relative cheapness of nitrate of soda argument, having in 1909 seen a large increase in the consumption of that article when the price was relatively very dear. Although the lower level of sugar prices would leave a smaller margin of profit for beet growers, they thought that the margin was still enough to induce a generous use of nitrogenous fertilizers in all beet-growing countries. While admitting that a further shrinkage in demand from Germany must be reckoned upon, and perhaps also from Spain, they were confident that Japan could be depended upon for support; and they knew that, on contracts made in advance, shipments to the United States must for some months be large, though not on the scale of the late months in 1910. They were, therefore, of opinion that the world's output would all be required, at fully the level of prices current at the end of 1910; and, as showing that even producers did not expect much more than this, it is pointed out that during the second half of 1910 it was always possible to buy for delivery in any position ahead at but a slight premium on the spot prices for the time being. Before the "Review" was out of the printers' hands, the market began a steady upward movement; and, in order that their friends may be able to trace the direction of shipments abroad, they insert their usual tables of exports, showing the shipments from January to March, April, June, and December respectively, as well as from July to December. From the January to December table, we take the following figures for the years 1910 and 1911.

	Year 1911. Tons.		Year 1910. Tons.
France, Germany, and Belgium	10,104	..	15,945
Spain and Portugal, Italy, and the Canaries	73,794	..	67,116
Holland, Java, British Guiana, West Indies, and the Mauritius	51,114	..	54,589
Japan	76,095	..	57,360
United States	65,920	..	76,111
Other countries	14,856	..	12,651
Total	291,883	..	283,772

Home consumption for fertilizing purposes in the United Kingdom, it is remarked, still tends to decline; but again the decline has been balanced by larger requirements for chemical purposes.

Statistics as to Prices.

As to prices of sulphate of ammonia, the "Review" states that from £12 16s. 3d. per ton f.o.b. Hull, at the outset, there was an advance to £13 8s. 9d. in January, and to £14 3s. 9d. in February. After touching £14 6s. 3d. early in March, the price drooped to £14 1s. 3d.; the exceptionally heavy demand for the United States, which caused the advance in January and February, having fallen off. Stocks being

quite cleared out at the end of February, producers were able to withstand fairly well the drooping tendency in March; but in April the case had become hopeless, and down to £13 12s. 6d. per ton was accepted. In May, the pace was still faster, producers having frankly faced the situation and offered their output as it became available; and at the close of the month, the price was down to £12 18s. 9d. In June, after a decline to £12 16s. 3d., there was a recovery to £13 2s. 6d., which was 6s. 3d. per ton above the opening price in January. The average price for the six months was £13 10s. 5d., or 33s. per ton above the average for January to June, 1910, and 14s. 2d. per ton above the January opening price. From first to last, the market had free play; and it cannot be said to have suffered at any time through speculative action. Demand being good, and no surplus stock having been brought forward from June, there was an advance to £13 17s. 6d. in July and to £14 2s. 6d. in August. In September, there was a set-back to £13 17s. 6d., but a recovery to £14 1s. 3d. Up to £14 5s. per ton was paid in October; but £14 3s. 9d. was the closing price, and, with but slight variation, this remained the value all through November. Owing to larger requirements for Japan and the sugar-growing group, the market has been able to resist the effect of the shrinkage in American demand in recent months; and though the price fell to £14 2s. 6d. per ton in the first half of December, it had recovered to £14 3s. 9d. at the close of the year.

The average price for January to June was £13 1cs. 5d. per ton, or £1 13s. per ton above that for January to June, 1910. The average price for July to December works out to £14 per ton, or £1 11s. 2d. per ton above that for July to December, 1910. The average for the whole year is £13 15s. 3d. per ton, or £1 12s. 1d. per ton above the average price for 1910; and it is necessary to go as far back as 1884 to find as high an average price—that for 1884 having been £14 9s. 3d. per ton. Messrs. Bradbury and Hirsch think that this result is satisfactory in itself. In relation to the average price of nitrate of soda for 1911, they say that it should be regarded as still more satisfactory, and especially when it is remembered that, while there has been a material decline in the value of tankage and other nitrogenous material, the price of sulphate of ammonia at the close is but a shade below the highest level reached during the year. They have, therefore, again the pleasure of offering hearty congratulations to producers upon such an excellent result.

Figures of Production.

No figures representing the actual production in Germany in 1910 being so far available, it can only be assumed that the estimate of 375,000 tons which the firm were able to obtain at the end of that year was fairly correct. The estimate for 1911 is about 400,000 tons; and it does not show as large an increase as the one in 1910. Germany is now, however, an easy first as a producer of sulphate of ammonia, as well as being by far the largest consumer. The output in France in 1911 has been 60,000 tons, and that in Belgium about 40,000 tons—again a slight increase upon the preceding year in each case. Production in the United States is estimated at 127,000 tons—an increase of 11,000 tons upon that in 1910. In other countries there have been increases which in the aggregate amount to a substantial quantity; but exact figures are not obtainable. The world's production is, therefore, now fast approaching 1,150,000 tons per annum. In the United Kingdom, there has been an increase in output which is estimated at 11,000 tons; and again the increase has been mainly from carbonizing works.

The production of ammonia, calculated into sulphate (including that used in the manufacture of ammonia soda and for other chemical purposes), from all sources in the United Kingdom during 1911, is estimated at 378,500 tons, apportioned as follows:—

	Tons.
Gas-works	169,500
Iron ,,	20,000
Shale ,,	60,000
Coke and carbonizing works and producer gas	129,000
	378,500

Of this production, Messrs. Bradbury and Hirsch reckon that England contributed 256,000 tons, Scotland 119,500 tons, and Ireland 3000 tons. The production (in tons) during the previous five years was as follows:

	1910.	1909.	1908.	1907.	1906.
Gas-works	168,000	164,000	165,000	165,500	157,000
Iron ,,	20,000	20,000	18,000	21,000	21,000
Shale ,,	59,000	57,000	53,500	51,000	48,500
Coke and carbonizing and producer gas	120,500	107,500	85,000	75,500	62,500
Totals	367,500	348,500	321,500	313,000	289,000

Messrs. Bradbury and Hirsch's estimate of the production in the United Kingdom in 1910 was 1500 tons over the mark—iron and shale having realized 1000 tons each less than expected, and carbonizing works 500 tons more than estimated. They do not think their estimate of stocks was at fault; and, if it was correct, the home consumption must have been less than was thought. If it is assumed that stocks at the end of 1910 amounted to 12,000 tons, and that the estimate of production during 1911 is correct, the account for 1911 will stand as follows:

	Tons.
Stocks brought forward from 1910	12,000
Production during 1911	378,500
	390,500
Exports during 1911	292,000
Home consumption (for all purposes) in 1911	85,500
Stocks to carry forward into 1912	13,000
	390,500

A Consideration of the Prospects.

Messrs. Bradbury and Hirsch next proceed to consider the following question: If there is an increase in the world's production of (say) 20,000 tons within the next four months, compared with the output over the same period in 1911, what are the chances of the market? It is, they say, reported that the bulk of the German output of sulphate of ammonia over the whole of 1912 has already been bought up; and this would seem to show that distributors in Germany have no misgivings either about the capacity of their market or the stability of prices. The present situation in the United States differs very widely from the one at the end of 1910. At that time the price of cotton was, owing to a short crop, much inflated; and in this there was every inducement to aim at a record crop in 1911 and to fertilize on the most liberal scale, no matter at what cost. Exceptionally heavy shipments of sulphate of ammonia had been made from the United Kingdom from July onwards, and further heavy purchases had been made for shipment in 1911. It may be said, in fact, that the extra American demand did more than anything else to sustain the market in the closing months of 1910, and to inflate prices over the early months of 1911. What was aimed at a year ago was more than achieved; and a crop of over 15 million bales has brought about such a collapse in the price of cotton that for the time being growers seem to be in despair. The reviewers state that they are not inclined to take so pessimistic a view. Various schemes have been propounded for bolstering up the market in the interests of growers; but, so far as they can see, they are all economically bad. The sulphate of ammonia market had some experience in bolstering by means of withholding supplies sixteen years ago; and the experiment has not been repeated. They are quite satisfied that cotton growers will do best in the long run if they let the market take its natural course. They will be much more likely to see a solid recovery in prices before the present crop is done with.

In the meantime, the outlook for the fertilizer trade in the United States is not brilliant. It is not likely that such a large crop of cotton will be aimed at; while it is quite certain that a larger supply of cottonseed meal for fertilizing purposes will be available, and, consequently, that a smaller supply of other fertilizers will be required. It is not to be expected that imports of sulphate of ammonia over January and February will be on anything like the scale of those in January and February last; but should cotton prospects improve, as it is thought they will, it is extremely probable that much larger imports of sulphate of ammonia in the following months will be required than over the corresponding period of 1911. Extreme views are apt to be pushed to excess in the United States; and the firm are inclined to think that the subject now discussed may prove a case in point. As regards the near future, however, they are afraid that the sulphate of ammonia market cannot look to the United States for support.

Owing to abnormal circumstances in Japan, described in the last "Review," the heavy Japanese demand only commenced in February last, and only reached its maximum in March, April, and May. This season the heavy demand has already set in; and, as there have been large inquiries on the market for near months, it is thought that increased shipments in January and February may go a considerable way towards neutralizing the defection of the United States. Though shipments to Spain from July to December were on about the same scale as in 1910, it must be noted that those for July to December, 1910, showed a shrinkage of more than 4000 tons compared with 1909, and that the shrinkage was due to the competition of German production. The shrinkage this year, compared with 1909, has been due to a different cause. Partly deterred by the high level of prices, and partly in the hope of again being able to avail of German supply on at least as large a scale as in the second half of 1910, Spanish buyers have all along bought very moderately for prompt and near delivery, and have only in recent months come forward freely in regard to their spring requirements. They therefore think that one may safely count upon increased shipments to Spain over the near months. Seeing that there has been no increase in German shipments to the Dutch East Indies within the past six months, and seeing that there has been a moderate increase in shipments from the United Kingdom to all the sugar-growing colonies, including Java, it seems reasonable to expect that shipments from the United Kingdom over the near months will be at least on as large a scale as in 1911. Both the prices of sugar realized and the prices in prospect justify even larger supplies of sulphate of ammonia.

It is not thought that there is much to expect from home consumption, unless for chemical purposes. For fertilizing, sulphate of ammonia is freely used in less than half-a-dozen counties in the United Kingdom; and in many others it is scarcely employed at all. Moreover, nitrolim is coming into larger use in the preparation of compounds; and as far as this goes, it means displacement of sulphate of ammonia mainly.

"If, then," continue Messrs. Bradbury and Hirsch, "there is nothing to hope for in home consumption or in Continental demand, and if a serious shrinkage in shipments to the United States over the next two months must be reckoned upon, What are the prospects of the increased supply being absorbed, in view of the abundant supply and relatively low price of nitrate of soda? In the first place, if there is nothing to hope for in the shape of increased demand from the Continent (Germany, France, and Belgium), there is not much to fear in the shape of a further shrinkage, seeing that the total shipments January to June, 1911, amounted to only 5641 tons. If we have rightly gauged the opinion and attitude of German producers and distributors, they are not likely to increase their activities in foreign markets; and, if they do not, we think that increased requirements for Spain, for Japan, for the sugar colonies, and newer and smaller markets, will be quite enough to absorb the United Kingdom supply, notwithstanding the shrinkage which we anticipate in United States requirements, and at the same time to sustain the market at the present level of prices. Having regard, however, to the relative cheapness of nitrate of soda, we do not see that a much higher level of prices for sulphate of ammonia is either justified or likely to be seen. If the trouble in the cotton manufacturing districts, which has unfortunately arisen at the close of the year, is protracted, it will mean the postponement of any recovery in the cotton market, and probably a still smaller demand for sulphate of ammonia for the United States; but it will also involve a shrinkage in the output of sulphate of ammonia in the United Kingdom that will more than balance the United States shrinkage. As far as it goes, the lock-out is calculated rather to improve than to injure the prospects of sulphate of ammonia."

The "Review" concludes with the usual record of the course of the market month by month; and this is followed by the customary

tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 7, sulphate was £13, and nitrate £9 10s. per ton; on April 1, the prices were £13 17s. 6d. and £9 12s. 6d.; on July 1, they were £13 7s. 6d. and £9 17s. 6d.; on Sept. 2, £14 and £9 17s. 6d.; and on Dec. 30, £14 3s. 9d. and £10 2s. 6d. respectively. The second table shows the average prices per cwt. of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1902, 9s. 4d.; 1903, 9s. 6½d.; 1904, 10s. 2½d.; 1905, 10s. 9½d.; 1906, 11s. 4d.; 1907, 11s. 2d.; 1908, 10s. 2½d.; 1909, 9s. 9d.; 1910, 9s. 4½d.; and 1911, 9s. 10¾d. The third table gives the average prices per ton of good grey (24 per cent.) sulphate f.o.b. Hull; the figures ranging over 45 years —1867 to 1911. The following are the averages for the past ten years: 1902, £11 16s. 3d.; 1903, £12 9s. 2d.; 1904, £12 3s. 8d.; 1905, £12 10s. 9d.; 1906, £12 0s. 9d.; 1907, £11 15s. 8d.; 1908, £11 12s.; 1909, £11 5s.; 1910, £12 3s. 2d.; and 1911, £13 15s. 3d.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

Reduction in Price—Official Changes—Committee and Master Gas-Fitters.

At last Tuesday's meeting of the Birmingham City Council, which was presided over by the Lord Mayor (Alderman Bowater), several matters were discussed in connection with the Gas Committee's report.

Alderman Sir Hallewell Rogers, in submitting the report, and moving the adoption of the first recommendation—that the price of gas be further reduced, as from the Christmas reading of the meters, in accordance with the scale drawn up, and referred to on p. 98 of last week's "Journal"—said that, if the scheme suggested were adopted, this would be the second reduction within twelve months. The reason why these reduced prices were brought forward now was that the estimates for the year ending in March showed a larger surplus than was anticipated; and the Gas Committee felt that some of the surplus at least should be given to the consumers. This was why they recommended that the reduction in prices should take effect as from the December reading of the meters. He wished emphatically to state that these proposals were not in any way due to a desire on the part of the Gas Committee to compete unduly with the Electricity Supply Department. The Committee were convinced that, even with these reductions, they would be able to contribute at least the same sum in cash to the relief of the rates as that given last year—namely, over £75,000. It was gratifying to note the increase in the consumption of gas in Birmingham. The present satisfactory condition of the finances of the department, which rendered it possible for the Committee to take the unprecedented course of recommending two revisions of prices in one year, was the outcome of a long series of circumstances which had all tended in one direction—the augmentation of income without a corresponding increase in expenditure. This had been due in no small way to the organization of the department; and they were now reaping some of the advantages of the late Mr. G. Hampton Barber's services to the undertaking. The second reason was that a very considerable proportion of the coal required during the twelve months ending June 30, 1913, had been secured at this year's prices, and that the whole of the gas oil needed during the twelve months ending Dec. 31, 1912, was bought some months ago, when the oil market was very depressed, and was obtained at a much lower figure than current prices. These purchases were made upon the advice of the Secretary and Manager (Mr. R. S. Hilton). It was due, thirdly, to the fact that the prices now being obtained for residual products were very high. But there was nothing at present to indicate that anything would arise in the near future to seriously affect the income from these sources. Fourthly, the output of gas was steadily increasing; there being an increase of no less than 3½ per cent to date over the abnormally heavy output of last year. Improved results obtained in carbonization, and the consequent reduced cost of production, should also be mentioned. In all the circumstances, the Committee were strongly of opinion that there was no justification for the retention of the scale of prices authorized in May last, and that they could with safety advise the Council to adopt the revised scale. As to the scheme itself, it would be seen that, as was the case in May last, the consumers of the smaller quantities of gas were securing the greatest advantages. The consumers by prepayment meter who did not provide their own fittings—and this class formed about 90 per cent. of the whole of the penny-in-the-slot consumers—would receive 35 cubic feet per penny, instead of 31 feet—an increase in quantity which was equivalent to nearly 3¾d. per 1000 cubic feet; while the remaining prepayment consumers would receive an additional 4 cubic feet per penny, and would pay practically 3d. per 1000 cubic feet less than at present. It was gratifying to find that the quantity of gas per penny proposed to be supplied was greater than in any other town in the country. Moreover, those consumers of this class who provided their own fittings would pay less per 1000 cubic feet than ordinary consumers were paying twelve months ago, and the remainder would pay only slightly more. Consumers using with ordinary meters less than 50,000 cubic feet per quarter—and this was by far the largest class on the books—would secure a reduction of 3d. per 1000 cubic feet; while the remainder of these consumers would have a reduction of 2d. Gas supplied for manufacturing and motive power purposes would be charged at a reduction equivalent to 2d. per 1000 cubic feet. The Gas Committee were convinced that these prices would be equally fair to all interests concerned. They compared favourably with those of any other city in the kingdom, taking into account the fact that Birmingham was about 70 miles from the nearest coalfield in which gas coal was raised.

Mr. Stevens contended that the small consumers were paying too high a rate for gas, as compared with the large ones. The difference between the highest and the lowest rates, he pointed out, amounted to 11d. per 1000 cubic feet; whereas in Bristol the difference was only 6d., and in Sheffield 4d. To sell gas at 1s. per 1000 cubic feet meant a loss, for which the small consumers would have to pay. Without moving an amendment, he desired to enter a protest against the proposed rates.

Sir Hallewell Rogers, in reply, said the whole of the Gas Committee, except Mr. Stevens and another member, were convinced that the suggested charges were fair and reasonable. The large consumer was less expensive to supply than the small one. The difference of 11d. between the highest and lowest rates was perhaps rather large, but their idea was eventually to reduce it. They must remember that the manufacturer who consumed gas ought to have it at the cheapest possible price, to keep labour and industries in the city.

The resolution was carried.

The Committee's recommendations with regard to appointments and salaries then came up, and were agreed to after one or two amendments on the question of salaries had been defeated. The recommendations adopted were: That Mr. Walter Chaney, Engineer at the Nechells works, be appointed Engineer of the Saltley works (with the continued supervision of the Adderley Street works), in place of Mr. F. J. Bywater, at a salary of £800 per annum, as from Jan. 1, 1912; that Dr. W. B. Davidson, Chief Chemist, be appointed Engineer of the Nechells works, at a salary of £700; that the salary of Mr. John Foster, Engineer of the Windsor Street works, be increased from £700 to £800 per annum; that the salary of Mr. T. H. Hack, Engineer of the Swan Village works, be increased from £400 to £500; and that Mr. E. W. Smith, at present in charge of the high-pressure laboratories, be appointed Chief Chemist, at a salary of £400.

The Committee further reported that an agreement had been arrived at between the Committee and the Birmingham and District Master Gas-Fitters' Association, regarding the employment of master gas-fitters to carry out work for the department, and the prices to be paid for such work.

Mr. Kneeshaw complained that the Committee had been lacking in courtesy in not presenting a full explanation of what their proposals were. He assumed that what had been done had been satisfactory to the Gas-Fitters' Association, who, he understood, were jubilant over the concession made to them.

Sir Hallewell Rogers explained that the position was that the Committee had made friends with the Gas-Fitters' Association, instead of fighting them.

The matter then dropped; and the report of the Committee was adopted.

LECTURES ON ILLUMINATING ENGINEERING.

Syllabus of the Northampton Polytechnic Institute Lectures.

At the opening of the session for 1911-12 of the Northampton Polytechnic Institute, St. John Street, E.C., it was mentioned in the "Journal" that the work of the session would include lectures on "Illuminating Engineering." We have now received from the Principal (Dr. R. Mullineux Walmsley) a syllabus of the course, which will consist of ten lectures, to be given on Tuesday evenings at 7.30 p.m., commencing to-night, when Mr. S. D. Chalmers will deal with "The Nature of Light and of Radiation." The lectures are intended for a technical audience; and each lecture will be given by a specialist in the particular subject. The following are the syllabuses of the lectures of special interest to "Journal" readers, with the dates of their delivery and the names of the lecturers.

Photometry and the Measurement of Light.

[Jan. 23. Mr. A. C. Jolley.]

Measurement of light dependent upon physiological sensation; scope of investigation; unit. Photometry: Fundamental laws, quantities to be measured, standards of light, types of photometer screen, methods of making photometric measurements; intense sources of light; mean horizontal and mean spherical candle power; distribution of light; illumination photometry, reflecting power, heterochromatic photometry, absorption, flicker, and discrimination spectrophotometry and spectrophotometers; light energy; methods of exploring the visible spectrum with the radio-micrometer, bolometer, and linear pile.

Chemistry of Gas Manufacture and Lighting.

[Feb. 13. Mr. S. Field, A.R.C.S.]

Illuminating value and manufacture of coal gas; composition of gas; illuminants, diluents, and impurities; effect of temperature of distillation and time on the candle power of gas; properties of essential constituents; chemistry of combustion; essential conditions for luminous and non-luminous combustion; heating value of constituents; temperature of flames and the development of high temperatures for mantles.

Use of Shades and Reflectors.

[Feb. 20. Mr. S. D. Chalmers, M.A.]

Cases in which reflectors may be used; the laws of reflection; reflecting power of different substances; design of reflectors for special purposes; use of shades and scattering surfaces; coloured and fluorescing screens; dioptric globes; protective glass; problems in utilization of daylight; reflecting prisms and diffusing windows.

Practical Use of Gas-Lamps.

[March 19. Mr. F. W. Goodenough.]

Types of burners and mantles; practical considerations limiting the use of various types; polar distribution curves; practical cases where gas-lamps are used, and the considerations governing the choice of type; the position and arrangement of the lamps.

The course is regarded by the governing body of the Institute as a pioneer one. Should it be as successful as its importance warrants, it will in subsequent sessions be developed into full special courses, including laboratory and other important ancillary work. The fee for the whole course to members of the Institute is 10s.; to non-members, 15s. The fee for a single lecture, whether members or non-members, is 2s. 6d.

HAMPSTEAD PUBLIC LIGHTING SCANDAL.

At a Meeting of the Hampstead Borough Council last Thursday, there was a full discussion of the events which led up to what has become known in the district as the electric lighting scandal. Owing to the Mayor (Mr. G. W. Holtzapffel) having to leave before the discussion came on, the chair was occupied by the Deputy-Mayor (Mr. William Woodward). The great interest taken in the matter was evidenced by the crowded state of the public gallery.

Financial Position of the Electricity Undertaking.

The proceedings opened with a discussion on the financial position of the electricity undertaking. In the course of it, the Chairman of the Lighting Committee (Mr. O'Bryen) said a great amount of misapprehension had arisen in the borough owing to the fact that it was necessary to hold the previous meeting of the Council *in camera*. It was clear from what then took place that the excess of capital expenditure, amounting to about £9000, upon the conversion of the gas-lamps to incandescent electric light, was due to under-estimating and the juggling of figures, by which means Mr. Sayer, the Assistant-Engineer, misled Mr. Cottam, the Chief Electrical Engineer, and the Lighting Committee. Though the excess expenditure was due to under-estimating, it should be made clear that there was not the slightest suspicion that a penny had been misspent or diverted from its proper purpose. It had been decided that the excess should be charged to the reserve fund of the electricity undertaking, and be paid back out of the profits accruing year by year during the next eight years. The only way in which this could affect the ratepayers might be that the amount taken from profits in relief of the rates would be reduced for a year or two. But against this must be put the fact that there would be an annual reduction in the cost of street lighting; and he quite expected that in a year or two they would get back the halfpenny in the pound in relief of the rates. The Lighting Committee had contracted to light the borough at the rate of £2 5s. a lamp, compared with £3 4s. 9d. previously paid to the Gas Company; he would not compare the price with the last offer of the Gas Company of £2 5s. Eventually there would be a saving of 1d. in the rate. Mr. H. M. Hulls sought to find out the estimated saving if the Committee's price for light was compared with the Gas Company's last offer; and he was informed that the offer was for inverted mantles, and the Committee were satisfied that, owing to the difficulty of getting sufficient even pressure necessary for this kind of lighting, the light would be unsatisfactory.

The Chief Electrical Engineer's Resignation.

The Lighting Committee reported that they had considered a letter from Mr. G. H. Cottam, stating that he desired to relinquish his duties as Chief Electrical Engineer at a date convenient to the Council; and they recommended that the resignation be accepted, and Mr. Cottam's engagement terminated on the 12th of July. In moving the adoption of the recommendation, Mr. O'Bryen said the Committee thought it would be expedient, in the interests of the Council, to retain Mr. Cottam's services until the installation of the new machinery, of which he had been in charge for eighteen months, was completed. Mr. Ashenden moved, as an amendment, that the engagement be terminated in three months' time. This was defeated by 22 votes to 10; and the Committee's recommendation was adopted.

The next recommendation of the Committee was: "That the question of granting a superannuation allowance to Mr. Cottam on his retirement be referred to the Finance Committee for consideration and report." In the course of his remarks in support of the recommendation, Mr. O'Bryen reviewed Mr. Cottam's work during the seventeen years he had been with the Corporation, and said he did not think much could be found to complain about. Under all the circumstances, he asked the Council to take the view that by the loss of his position Mr. Cottam had been sufficiently punished for what had occurred, and adopt the recommendation. Mr. Candler said he was sorry that a proposal had been made to refer the matter to the Finance Committee. He considered they were all to some extent responsible for the loss of the £10,000. Mr. Ashenden moved, as an amendment, that the further consideration of the subject be postponed for three months, or until after the Local Government Board inquiry. Mr. O'Bryen accepted the amendment; and it was carried by 26 votes to 7.

Mr. Thomas Glover's Views.

In the course of a letter addressed by Mr. Thomas Glover, who resides at Marlborough Mansions, West Hampstead, to the "Hampstead and Highgate Express" last Saturday, he made the following remarks.

There are three points which seem worthy of special consideration, to which too much attention cannot be given.

With regard to efficiency, it must be obvious to all concerned that not only is the present system of lighting the borough inferior to the upright incandescent gas-burners previously used, but it is even worse than the system employed before this—the old-fashioned luminous gas-flames with batswing burners. An object-lesson is available for anyone. At the end of the Spaniards' Road on the borough boundary, outside the Spaniards' Inn, anyone who is sufficiently interested can take up his position equi-distant between a standard fitted with two metallic filament globes and a gas-lantern fixed on the Spaniards' Inn which has an old flat-flame burner, when it will be at once seen that the older type of lamp is giving a more effective light than the present converted standards and lamps fitted with two electric metallic filament globes. Close to these two lamps is another lamp fitted with an inverted incandescent burner, which forms a still greater contrast as to the efficiency of the rival systems of gas and electric light. This difference is sufficiently marked on a fine evening; but should the conditions of the atmosphere be foggy, or even slightly misty, the hopeless inefficiency of the electric light is even more apparent.

Another very serious point to which at present sufficient attention has not been given is that, owing to the grossly overloaded state of the electric mains, all the users of electric current in Hampstead, whether for lighting or for power, are in effect being robbed on account of the drop in the voltage. This loss of power in many parts of the borough prevents a satisfactory light being obtained by consumers, even with the modern metallic filament lamps, which, in my experience, not only do not result in saving expense to consumers, but, owing to their increased cost over the old carbon filament lamps and the more frequent need of renewals, make the total cost of light to consumers more expensive than before their introduction.

The final point which should not be lost sight of is the position of the electricity undertaking. Until recently, the undertaking, though in many respects behind the times, was in a position, as the result of efficient management, to contribute handsomely to the relief of the rates; whereas now, owing to the extra expenditure incurred in demonstrating the "advantages" of municipal trading, not only will this contribution to the relief of the rates be lost in the future, but probably part of the additional cost will almost immediately be taken from the ratepayers' pockets. There is the further consideration that not only will the loss in the present lighting scheme have to be paid for almost immediately, but it will probably be found that the overload at certain times of the day is so great that the whole of the plant will have to be not only extended but modernized, and perhaps replaced altogether.

BELFAST GAS-WORKS EXTENSIONS.

Withdrawal of Opposition to the Bill.

The Gas and Law Committees of the Belfast Corporation held a joint meeting on the morning of the 6th inst., for the purpose of having a further conference with the deputation from the ratepayers who had intimated their opposition to the Bill which has been promoted in reference to the proposed extension of the gas-works. Alderman J. Craig presided, and there was a good attendance. At a meeting held the previous day, after a discussion in which the proposals of the Corporation were carefully explained to the deputation and the latter expressed their views on certain points, an amicable understanding was practically arrived at. Before waiting upon the two Committees on the 6th inst., the deputation had reported to the Ratepayers' Committee whom they represented; and, having obtained the approval of this body, they attended the adjourned meeting, where, after a friendly discussion of about an hour's duration, the settlement was ratified to the mutual satisfaction of both sides. The proceedings were, of course, conducted in private; but the "Belfast News Letter" understands that it has been arranged that the site of the old abattoir shall be utilized for the erection of a gasholder, purifying plant, &c.; while the portion of the ground nearest an adjacent street will be reserved for the manufacture of residual products and for storage purposes. In consequence of this question of proceeding with the agreement, the demand for a poll on the Bill will be withdrawn. The above-named paper remarks: "This solution of the difficulty that had arisen is one upon which all concerned are to be heartily congratulated; and it is to be hoped that the Corporation Bill will now meet with no opposition, so that nothing may interfere with the carrying out of the extension scheme as speedily as possible."

PUBLIC LIGHTING OF SLOUGH.

At the last monthly meeting of the Slough Urban District Council, the Lighting Committee recommended the acceptance of the following tender of the Slough Gas Company, subject to a formal contract being entered into for seven years, to include a provision that the Council may have the option to determine the same at the end of the first three years: (1) To supply gas, per lamp, small plain light, exclusive of lighting, extinguishing, maintenance, and cleansing, to be worked by automatic controller (controllers to be set so that lamps are lit three-quarters of an hour after sunset and extinguished at midnight) at £1 5s. per lamp. (2) To supply gas, per lamp, small incandescent light, exclusive of lighting, extinguishing, maintenance, and cleansing, to be worked by automatic controllers (controllers to be set as above stated) at £1 5s. per lamp. (3) To supply gas by meter to five alarm lamps, exclusive of lighting, extinguishing, maintenance, and cleansing, to be worked by automatic controllers, at 3s. 6d. per 1000 cubic feet. (4) To supply gas to nine large lamps for the sum of £63 per annum, on condition that three burners as at present are used in each lantern, and that the three burners be lit at sunset—two to be extinguished at midnight, and the third at sunrise. The Committee further recommended that the tender of the Horstmann Gear Company to supply 347 (type 3) controllers at 28s. each be accepted.

Mr. Hibberd explained that the idea of the controllers was that the whole of the district would be lighted at a given time, which would save over half-an-hour when lighted, and also when extinguished. It meant that they would effect a saving of 12s. per lamp; the price being £1 5s. per lamp, instead of £1 17s.

The Surveyor presented a report showing that the cost of the controllers for the small lamps, paid for in eight half-yearly instalments, with interest at 4 per cent. per annum on the outstanding balance, would be £527 1s. 10d.; and the extra labour in this period would come to £52 10s. Against this there would be a saving in gas of £728 14s.—leaving a net gain of £149. Then on the nine large lamps, while payment was being made for the controllers, there would be a saving of £23—making the net gain in the period named £172 5s. When the controllers were paid for, he added, the annual saving would be about £200. The guaranteed minimum life of the controllers was twenty years.

After it had been pointed out by Mr. Harbert that these controllers were already in operation in Slough and many other places, and that everybody spoke in their favour, the tender was accepted.

At a meeting of the Audley Urban District Council, it was decided to ask Mr. E. D. Wootton, Gas Engineer at Cockermouth, to examine the gas-works and mains, and present a report thereon.

GAS AND ELECTRIC LIGHTING IN DUBLIN.

In the Nisi Prius Court, Dublin, last week, Mr. C. H. O'Conor, one of the Inspectors of the Local Government Board for Ireland, continued an inquiry which has been instituted for the purpose of enabling the Board to arrive at a determination, before the 31st of March next, with regard to the several heads of expenditure, &c., specified in section 3 of the Dublin, Rathmines and Rathgar, and Pembroke (Equalization of Rates) Act, 1901.

In the course of the proceedings,

Mr. *H. F. Cotton*, the Superintendent of Public Gas Lighting for Dublin, contrasted the city with Liverpool from the public lighting standpoint. He said Liverpool was a city where the Corporation bought the gas as they did in Dublin. The cost in Liverpool was 16s. 4d. per lamp without gas; and this included lighting, attendance, repairs, mantles, &c. The cost per lamp without gas in Dublin was £1 1s. 5d. This had increased in recent years, because the plant in Dublin was in a very bad state. When he took office in 1909, most of it was only fit for scrap; and the increase in the cost per lamp without gas from about 17s. to £1 1s. 5d. was largely due to necessary replacements. The cost of gas in Liverpool was 2s. 3d. per 1000 cubic feet, and in Dublin 3s. per 1000 cubic feet net. In Liverpool the public lamps were practically all incandescent. In Dublin all were incandescent except about 5 per cent. In other towns, such as Belfast and Manchester, it was difficult to make comparisons with Dublin, because the gas there was supplied from the Corporation gas-works.

Mr. J. GORDON, K.C., M.P., who appeared for the Rathmines and Rathgar Urban District Council, quoted figures comparing the cost of gas and electricity in 1901 and 1911. He said in 1901 the total cost of gas for public lighting was £9358 and of electricity £2025; whereas in 1911 the cost of gas was £7779, and of electricity £12,654.

Witness said he had no responsibility for electric lighting, but he could say that the lighting of the city had vastly increased during the last five years. This was partly due to the introduction of the arc light and also to better gas lighting, though a smaller quantity of gas was used. The charge for lamplighters had increased; and the men had now sick pay, extra pay for holidays, &c. One main reason of the increased cost was that the lamplighter was now a skilled man, who had to be able to deal with modern apparatus and both upright and inverted incandescent burners.

Mr. *William Ruddle*, the City Electrical Engineer, gave figures relating to the electric lighting of the city. He said that the cost of arc lamps for maintenance was £22; £2 5s. for 50-candle and £2 10s. for 100-candle incandescent lamps. The cost varied owing to the difference in the tenders for carbons. They had eight arc lamp trimmers, two assistant trimmers, two inspectors, and nine labourers, on an average, and a mechanic for repairs in connection with public lighting. This staff was absolutely necessary. In the city they lit on an average for 3800 hours per annum. Asked if he would expect a decrease in the gas expenditure as the use of electric lighting increased, he replied that he was not dealing with gas.

The INSPECTOR remarked that one would expect, as a natural consequence, that as gas was replaced its cost would go down.

It was pointed out to the witness that, in spite of this replacement, the expenditure on gas had not gone down; and he replied that he had not gone into the matter.

In reply to the INSPECTOR, witness said he did not think the City of Dublin was over-lighted, but considered it was fairly lighted, according to modern requirements. In his opinion, the principal streets in Dublin were just sufficiently lighted for the purpose of the traffic. In the busy streets, there were more lamps per mile than in Rathmines; but this was necessary. They used to put out the arc lamps in the city earlier in the morning; but there were complaints of robberies from carts, and they found it was better to give the extra light.

Mr. *H. F. Cotton* supplemented his previous evidence by the production of a number of returns which had been asked for. He gave figures showing the average number of gas-lamps in the city and in the added areas in each year from 1907 to 1911. The number in the city was 3641; in the added areas, 869. There was an increase in 1911 compared with 1907. The cause was principally the taking over of new areas by the Corporation, new roads and new streets, and also the better lighting of the existing roads and streets, particularly the outlying roads in the added areas which were very indifferently lighted in 1901, when they were taken over from the old Commissioners. In 1911, the number of gas-lamps to the mile in the city was 36, and in the added areas 23·5. In the old city in 1901, the number of gas-lamps was 4250. In 1903, about 1100 gas-lamps were taken off by the introduction of electricity. But 500 new gas-lamps were introduced in other places; and the total in 1903 worked out at 3653.

Witness was cross-examined with reference to the various returns he had produced.

The INSPECTOR (interposing): The question is, Is the number of gas and electric lamps excessive, having regard to the adequate lighting of the streets for the citizens of Dublin?

Witness: The number is not excessive.

Mr. *F. J. Allan*, the Secretary of the Lighting Committee, was next examined, and produced a table giving figures relative to the lighting of the streets by gas and electric light. With regard to the charge of £22 per lamp, the Electricity Supply Committee had to maintain the lamps in the same efficient condition; and they would all have to be replaced within the next few years. They proposed to replace them out of revenue, and had already begun with the first batch.

The INSPECTOR: You do not think the lighting is in excess of the requirements?

Witness: No; certainly not.

This concluded the evidence on lighting.

After an explanation of the provisions by the Finance Committee, the Woking Urban District Council have decided to oppose the Woking District Gas Bill, and to invite the co-operation of the Guildford and Chertsey Rural District Councils.

SALFORD CORPORATION AND THE OUTSIDE DISTRICTS.

The decision of the Eccles Town Council to promote next session, in conjunction with the two neighbouring authorities, a Bill for the purpose of compelling the Salford Corporation to give effect to the decision of Lord Donoughmore's Committee as to the limitation of gas profits, has been confirmed by the electors of Eccles.

The Mayor (Mr. Scott Forbes), who presided, explained what happened in 1909 when the outside authorities opposed the Bill introduced by the Salford Corporation to obtain powers for gas-works extension, the acquisition of land, the raising of additional capital, and an amendment of the provisions in regard to the illuminating power of the gas supplied. He pointed out that though the Salford Corporation in the two following sessions gave notice of their intention to apply for powers in connection with their gas undertaking, no Bill was deposited. This was very disappointing to those who had fought against the Bill of 1909, and won on the main points. Finally, after careful consideration, it was decided last autumn by the outside authorities to promote a Bill of their own; this being the only way to compel Salford to give effect to the decision of the Select Committee of the House of Lords. It was a very simple Bill, and embodied the gas clauses as settled by Lord Donoughmore's Committee. The resolution approving of the Bill was carried with only one dissentient.

Similar meetings held at Worsley and Walkden passed unanimously resolutions in support of the Bill.

HEYWOOD CORPORATION AND VERTICAL RETORTS.

Gas Committee's Recommendations Confirmed.

The minutes of the Heywood Gas Committee submitted for confirmation at a meeting of the Town Council last Wednesday, contained a recommendation that the tender of West's Gas Improvement Company, Limited, for an installation of vertical retorts on the Glover-West principle be accepted. It was recorded on the minutes that Mr. W. Whatmough, the Gas Engineer, having presented to the Committee a special report on the tenders received for carbonizing plant, it was resolved that the members of the Committee should inspect the installation at the Droylsden works of the Manchester Corporation, and also the installation at Smethwick. At a special meeting of the Gas Committee held subsequently, the decision in favour of the Glover-West principle was unanimous.

Mr. D. Healey, the Chairman of the Gas Committee, in moving the adoption of the minutes at the Council meeting, informed the members that the question of a reconstruction of the carbonizing plant had been under consideration for about six years; and the reason why action had not been taken earlier was because they thought it better to wait and get the benefit of the experience of others. After careful investigation and inspection of different plants in operation, the Committee came to a unanimous decision that the Glover-West system of vertical retorts would be the best and cheapest for Heywood. The total cost, including the work to be done by the Corporation, and the erection of a coke gantry, was estimated not to exceed £9500. After paying all charges for interest and sinking fund in connection with the new plant, it was estimated there would be a saving of about £400 per annum, so that the reconstruction of the carbonizing plant would not only be carried out without any extra cost falling upon the consumer, but the department would have a profit on the outlay. Mr. Healey added that, if the scheme was approved, the Gas Committee at their next meeting would consider the question of applying to the Local Government Board for sanction to borrow the money required to carry out the work, and for other purposes, including the laying of new mains. In reply to a question, he said it was the intention of the Gas Committee under the new system to maintain the present illuminating standard—namely, 18 candles.

The minutes were confirmed without discussion.

As stated in last week's "JOURNAL," the Council, sitting as a General Purposes Committee the previous week, had details of the scheme laid before them, and after discussion confirmed the Gas Committee's recommendations.

PUBLIC LIGHTING OF ASHFORD, MIDDLESEX.

At a recent meeting of the Ashford (Middlesex) Parish Council, the question of lighting the parish was again brought up by Dr. Cock asking if there would be any difficulty in the Council maintaining the "Coronation" lamp which has been erected by the Voluntary Rate Committee. The Chairman replied that he did not think there would be any. Mr. Woods said if there was, the cost must be put on the voluntary system. The Chairman said Mr. Councillor Tyars, who was unable to attend the meeting, considered that the proposed thirteen lamps might be ordered. He had received some good offers. Mr. Woods said he thought they should be put up as quickly as possible, and so stop the mock trial which was announced to be held. The Chairman said the Council could order the lamps, and then a small Committee might go round. The subject then dropped.

The mock trial above referred to took place last Thursday, at the Church Hall, Ashford, and was considered of sufficient public importance to justify illustration in the "Daily Mirror" next day. There were three pictures—one being the trial scene, with the plaintiff in the box, another the solitary public lamp, and the third showing two of those who attended the trial groping their way home in the dark.

The Sheffield City Council, at their last Wednesday's meeting, appointed Mr. Arnold T. Watson as Auditor of the Gas Company's accounts for the Corporation. His salary (which is paid by the Company) has been raised from £75 to £100 for each half-yearly audit.

MOSSLEY CORPORATION GAS-WORKS EXTENSIONS.

Local Government Board Inquiry.

The Mossley Corporation having applied for powers to borrow £28,200 for gas-works purposes, Mr. M. K. North, one of the Local Government Board Inspectors, held an inquiry last Wednesday at the Mossley Town Hall. The Town Clerk (Mr. Joseph Hyde) explained that of the sum required £9000 was for meters, £5000 for cookers, £7000 for mains, £2200 for alterations at the gas-works, and the remaining £5000 for "working balances." Mr. T. Brooke, the Borough Accountant, stated that there was generally an overdraft at the bank of about £5000 for meters; and if the application were granted, this could be wiped out. Figures were submitted showing that the quantity of gas now sold was double what it was ten years ago. The Gas Engineer (Mr. James Taylor) said the extensions at the gas-works for which £2200 was required comprised a new boiler-house with two Lancashire boilers, stores, laboratory, an overhead cast-iron tank for tar, ammoniacal liquor, and water, and machinery for a workshop. The boilers will each be 24 feet long and 6ft. 6in. diameter, and work at 100 lbs. steam pressure. The old boiler-house will be added to the existing engine-house, which is to be entirely rearranged. A new exhauster and steam-engine will be added, and space provided for gas-compressing plant required in connection with a high-pressure main. In two-thirds of the Mossley area of supply the pressure to the consumer has never varied for the last fifteen months; and when the proposed high-pressure main is laid, the remaining consumers will have the benefit of a similar constant pressure. Of the £7000 set apart for mains extensions, about £4000 is for districts principally in the Saddleworth area. Included in it is an item for the part cost of a high-pressure feed main, about 2¼ miles long, which will be laid from the gas-works to Brownhill. There was no opposion to the application.

GAS AND WATER PROFITS AT HULL.

Reduction in Price.

The Water and Gas Committee of the Hull Corporation had before them at a recent meeting the estimates for the year ended March 31, 1913, submitted by the Engineer (Mr. C. B. Newton). He reckoned the income from the water undertaking at £67,965, and the expenditure at £31,450; leaving a gross profit of £36,515. Providing for a contribution of £2600 to the city fund, and the payment of £13,540 to the sinking fund and interest, he estimated a net profit of £20,375. The Committee purchase gas in bulk from the British Gaslight Company at 1s. 6d. per 1000 cubic feet, and retail it to consumers in the "old town"—that is, within the docks—at 2s. 6d. It was estimated that the income next year from the gas undertaking would be £11,460, and the expenditure £8740; leaving a gross profit of £2720. After payment of interest and sinking fund amounting to £2400, the net profit was estimated at £320. Mr. W. H. Cooper, who represents the "old town," moved that the price of gas be reduced by 3d. per 1000 cubic feet. He remarked that they had a reserve fund sufficient for some time. The Chairman (Alderman Feldman) pointed out that the reduction of 1d. would mean a loss of £292. He thought, however, that a reduction of 2d. might safely be made, and he hoped Mr. Cooper would accept this. Mr. Cooper agreed, and the Committee passed his motion unanimously.

PETERHEAD MUNICIPAL GAS UNDERTAKING.

Another Investigation Suggested.

At the Monthly Meeting of Peterhead Town Council on Monday last week, a long discussion took place on a motion by Mr. James Gordon to the effect that "another investigation should be made into the gas undertaking by a competent accountant."

Mr. GORDON, in the course of an exhaustive statement, reviewed the history of the gas troubles, and alluded to the result of the recent municipal election. He submitted that the electors had spoken conclusively in favour of an independent and thorough investigation. Mr. Gordon's motion also asked that investigations should be made as to whether there had been any irregularities in the management, what was the cause of the "bad gas" supplied to the town, the quality of the coal used at the works and the prices paid for it, and as to whether discounts and commission had been allowed. In concluding his speech, Mr. Gordon said the various points upon which he considered the community required to be satisfied had been embodied in his motion.

Mr. JOHN WILSON seconded the motion.

Mr. W. MARTIN, the Convener of the Gas Committee, moved the previous question. He subjected Mr. Gordon's remarks to a very searching analysis, and pointed out, with reference to the statement that the electors had given their votes against the majority of the Town Council, that one of the most loyal supporters of the Gas Committee was at the top of the poll with an unexampled vote, and one of the other two councillors—the one on the other side—was left out altogether. Mr. Martin denied that the quality of the gas was such as had been suggested; and as to the question of discounts and commissions, he said they all knew these were illegal. It would be an expensive matter to get a report on the lines indicated by Mr. Gordon; and, moreover, they were satisfied with the report they had had already. The gas-works were now in a favourable position. They started last year under a cloud; but they showed during the twelve months a working profit of £2608. The result was encouraging, and there was no reason why it should not continue. He appealed to the Council to give the new Committee a chance. He believed the gas undertaking was on a sound basis; and if they had a chance they would show better results next year than they had done in the past.

After several of the councillors had spoken, Mr. Gordon's motion was negatived by seven votes to four.

WATER-GAS PLANT AT NEW MILLS GAS-WORKS.

Inaugural Ceremony.

The installation of water-gas plant which has been put up, at a cost of £1800, by Messrs. R. & J. Dempster, Limited, of Manchester, at the gas-works of the New Mills Urban District Council was formally opened on the 6th inst. by Mr. J. J. Hadfield, J.P., the Chairman of the Gas Committee of the Council, who, ever since the gas undertaking came into their hands, has been unceasing in his efforts to make it a success. Special interest attaches to this installation, inasmuch as the loan necessary to defray the cost was the first sanctioned by the Local Government Board to an Urban District Council for the provision of water gas. The works were acquired by the predecessors of the Council (the old Local Board) about twenty years ago; and on that body giving place to the Council, the improvement of the works and plant was at once taken in hand. Almost every year the area of supply has been enlarged, and extensions have been proceeding. In all this work Mr. Hadfield has taken the deepest interest; while the Engineer and Manager (Mr. Philip Lancashire) has spared himself no labour to bring the works into the best possible condition. The latest addition is the water-gas plant just completed; and Messrs. Dempster's was decided upon after members of the Council had visited various places and inspected the plants in use there.

The formal opening took place in the presence of the members of the Council; and among the company were Mr. Arthur Andrew and Mr. T. Duxbury, of Oldham. Mr. H. S. Knight, the representative of Messrs. Dempster, was in attendance, and explained the working of the plant; and Mr. Hadfield said he had every confidence in it. It was exactly what was needed at New Mills; and he was sure Mr. Lancashire would do all in his power to make it a success. He believed it would be both a credit to the Contractors and a benefit to the people of New Mills.

Subsequently the members of the Council and others present were entertained at dinner by Messrs. Dempster, on whose behalf Mr. Knight presented a silver rose-bowl to Mr. Hadfield.

The plant which Messrs. Dempster have installed is essentially a combination of the Dellwik generator and the Lowe system of carburetting vessels, by which combination the special advantages of the short blasting period employed in the Dellwik generator is fully utilized, so that only sufficient carbonic oxide is produced to be burnt in the carburettor and superheater to maintain these vessels at their correct temperatures. The generator is fitted with self-sealing clinkering and ash doors; the connections being arranged for the gas to be taken off from the top or the bottom of the generator, when it is conveyed to the carburettor. At the top of the superheater an improved type of stack-valve is used, having a conical-shaped valve with a ball-joint so arranged as to remain tight under the varying conditions of working. From the superheater the gas is conveyed to the scrubber, in which it is thoroughly cleansed and cooled; but in the event of still further cooling being required, a condenser may be added. This, however, has not been found necessary at New Mills; so that the gas goes direct to the relief gasholder, from which it is taken to the foul main, where it meets the coal gas and passes with it through the various portions of the plant direct to the gasholder. Special mention should be made of the ingenious steam coke-hoist, used for hoisting coke from the ground floor to the stage. It consists of a vertical steam cylinder with a central piston and ram joined at the stage level to the usual type of jib crane. The hoist is controlled by a very delicate steam-valve, a slight movement of which permits the operator to raise the bogie containing the coke, and stop it at any desired point. It also enables him to lower with equal facility. With the exception of charging the coke into the generator, the whole of the operations are conducted from the ground floor. By a simple arrangement of levers, the various valves are interlocked in such a manner that it is impossible for the workman in charge to make a mistake in the various operations he has to carry out. The blower for supplying the necessary air to the generator is also of Messrs. Dempster's improved type, with steel revolvers and leather tongue-pieces, coupled direct to one of their vertical type engines; and it runs very quietly. The steam supplied to the generator is controlled by a suitable regulating valve, so that the operator opens his steam-valve to the generator full each time. The temperature in the superheater is recorded on a pyrometer fixed in full view of the operator, so that he has not to rely upon the rough-and ready method of deciding the heats of the vessels by means of his eye. The oil supply to the carburettor is obtained by means of a slow-running force-pump; the quantity being regulated by a vertical-type meter.

IMPROVED LIGHTING FOR TEIGNMOUTH.

A scheme for the improvement of the public lighting of the town was presented at a meeting of the Teignmouth District Council last Tuesday. The Surveyor estimated that the cost of new lanterns and burners, additional standards, &c., would be £563; and the Highway Committee recommended that a sum equal to a rate of 1d. in the pound on the general district rate be provided in each half-yearly estimate until the whole scheme is completed. Objection was taken to the carrying out of the scheme on the ground that there was a proposal before the Council to apply for a Provisional Order enabling them to supply electricity. Mr. Hayman accordingly moved that application be made for a Provisional Order; contending that the electric light would be particularly valuable to Shaldon, which, owing to its geographical position, was very inadequately lighted at present. If Teignmouth was to come to the front, they must make some effort to improve it; and there was no place where electric lighting could be carried out at a cheaper rate. Mr. Follet seconded the motion, and also spoke of the needs of Shaldon, which he said was in almost total darkness after sunset. Mr. Banbury moved that the matter be deferred for consideration by a Committee of the whole Council. As the Council owned the gas-works, it would need serious consideration before they decided to establish a rival undertaking, which might result in a big loss to the

gas-works. If they had not the gas undertaking in their hands, they might consider the question of introducing the electric light; but, under present conditions, the matter would need careful deliberation. Mr. Harris thought they should have some idea of the cost before they pledged themselves to introduce the electric light. They might be run into an expenditure of £20,000 to £25,000. Mr. Bird admitted that the electric light would be a very great boon to Shaldon if it could be introduced there; but the difficulty in lighting that district with gas was the crossing of the river. He thought, however, the place might be lighted by means (say) of petrol gas. The Gas Manager (Mr. J. A. Gray) said they could get as good illumination from gas as from electricity or any other method. If they were going to hang up the Highway Committee's recommendation with regard to improved lighting until they decided the electricity question, they would leave the town in a state of gloom for some time to come. The amendment to defer the question of electric lighting was carried, with an addition that the Committee should consider a system of lighting for Shaldon. Mr. French moved that the scheme of the Committee should be carried out; and the motion was agreed to.

COKE AS A DOMESTIC FUEL.

In the last issue of the "JOURNAL" (p. 101), we reproduced, from the Engineering Supplement to "The Times," a letter on the above subject by Mr. Kenneth R. Swan. It evoked one from Mr. Gilbert R. Redgrave, which appeared last Wednesday, and contained the following remarks.

For many years I have been in the habit of using a mixture of gas coke and ordinary bituminous coal for household purposes; and though I succeed fairly well in burning this fuel in the sitting-rooms, I have failed utterly to induce the servants to employ the mixture in the kitchen. The cooks invariably assure me that it will not produce a suitable fire for cooking purposes. I consequently hailed with satisfaction the statements concerning coalite, which seemed to possess many of the qualities required for domestic use; and more recently I have seen the so-called "tarless coke" burning in an open hearth and yielding a hot fire with a minimum of smoke.

My chief difficulty in using coke, whether it be the richer quality, specially adapted for house fires, or the ordinary gas coke, is that it appears to be necessary to employ a mixture of coal and coke; and this seems to be an almost fatal objection. The drawbacks mentioned by Mr. Swan—viz., the excessive amount of ash and the presence of sulphur—have not in my case proved an obstacle to the use of gas coke. It is no doubt more difficult to "light" the fire, if coke alone is employed; but this objection is overcome if a suitable mixture be made of about two parts of good bituminous small coal (nuts) with one part of coke.

I understand that in the preparation of coalite or of the tarless coke the illuminating gas, which is virtually a bye-product, is readily taken by the gas companies; and that, at any rate in the case of the latter description of fuel, all the sulphur and the ammonia are extracted. I may mention that in this process, which is conducted in retorts under a high vacuum, the coke made contains the whole of the fixed carbon. So that if the original coal contains 50 per cent. of this carbon, the resulting coke will have 75 per cent., and this naturally tends to reduce the equivalent proportion of ash. I can testify that this tarless coke burns freely and yields a hot fire. Moreover, there is sufficient gaseous matter left in it to produce a bright fire, which is in strong contrast to the dead fire obtained by the use of gas coke.

I hope this subject of the use of coke will be fully ventilated, because it seems almost the only way by which the London atmosphere can be purified, and freed from the existing plague of soot and fog.

PLUMBERS AND GAS-STOVE FITTING IN GLASGOW.

At the Annual Dinner of the Glasgow and West of Scotland Master Plumbers' Association last Wednesday, Mr. Alex. Wilson, the Manager and Engineer of the Glasgow Corporation, replying to the toast of "Our Guests," mentioned that since the gas exhibition was held a year ago, the department had sold 6000 gas-fires, and that about half of them had been fitted by outside traders. He did not think the plumbers had yet realized the immense amount of business that was to be done in gas appliances, as, for instance, in connection with the use of gas for water-heating purposes. It was said that the proposal to supply free cookers was to have some opposition. The furnishing of free cookers was entirely a business proposition on the part of the department. They wanted to get business, to do a good work for the consumers in a reasonable way, and give them part of the profits they brought to the department. For a long time gas in Glasgow was sold at a flat-rate; and they did very well in this way. But a few years ago they introduced differential rates. They had a lower rate for gas used for power, because, being taken practically in equal quantities all through the year, they were able to produce it much more cheaply than gas employed for lighting. The gas used for cookers, instead of being taken in winter, was practically all consumed in the summer time, when the plant would be lying idle; and they were consequently able to produce this gas cheapest of all. They ought, therefore, to give the people who used this gas some consideration. It would be a difficult matter to introduce a differential price, because the department would have to put in a double set of pipes, and extra gas-meters. In these circumstances, the easiest way to give the consumers some consideration was to supply them with cookers free. It was expected, as a result of this, that a large quantity of gas would be consumed in culinary appliances. A great deal of work would have to be done in connection with the cookers; and this he was certain would help the plumbing trade.

The Davis Gas-Stove Company write that, owing to increased business on the territory worked by their Mr. H. H. Dashwood, it has been necessary for him to give up calling on the London companies, and direct all his attention to the South and East Coasts.

STATISTICS OF ELECTRICITY UNDERTAKINGS.

Extracts from the Census of Production Returns.

In previous issues of the "JOURNAL" [Sept. 12 and 26] particulars were given of gas and water undertakings of the United Kingdom as furnished by the last of the series of preliminary tables which have been issued summarizing the results of the returns made under the Census of Production Act, 1906. We are now able to give those relating to the supply of electricity.

As in the cases of gas and water supply, already dealt with, the tables are based on returns received from both companies and public authorities; and the period covered is normally the year 1907. Returns in respect of the value of electricity generated were not required from factories, warehouses, shops, hotels, theatres, or other establishments possessing installations for the generation of electricity solely for their own use; nor from railway companies, light railway companies, and tramway companies. The generation of electricity in connection with municipal tramway and light railway undertakings is, however, covered by the returns received from local authorities in respect of their electricity undertakings. The returns made in respect of the central power stations at the Royal Arsenal and Royal Dockyard, Woolwich, are included in the tables with the returns received from public authorities. The total quantity of electricity generated by companies and public authorities (exclusive of that generated for their own use by industrial and commercial establishments and by railway and tramway companies) amounted to 1,430,069,000 Board of Trade units. Further, 174,607,000 units were generated by railway companies, and 54,743,000 units by tramway and light railway companies for their own purposes.

A certain proportion of the electricity generated is lost in transmission; and, under the limitations imposed by the Census of Production Act, it was not possible to require a statement to be made in the compulsory part of the schedule of the quantity of electricity supplied to consumers. A voluntary question was accordingly included in the schedule, requesting companies and public authorities to furnish information respecting the quantity of electricity supplied to consumers and the purposes for which it was supplied, together with the quantity used in the works.

Companies purchased from other companies or from local authorities 32,922,000 units of electricity, the estimated value of which was about £230,000; and local authorities purchased from companies or from other local authorities 14,042,000 units, the estimated value of which was about £105,000. Eliminating these duplicated amounts, the value of the electricity supplied by distributing companies and public authorities was about £8,568,000.

The net output of all the electricity undertakings covered by the report was £5,568,000; this sum representing the total amount by which the output of such undertakings, taken as a whole, exceeded the cost of the materials used in connection therewith and of electricity used in works or purchased in bulk by authorized distributors. The actual cost of such materials was about £3,000,000, and of the electricity purchased in bulk about £335,000.

The average number of persons employed in connection with electricity undertakings on the four days for which the numbers were returned was 22,618—viz., 18,824 wage-earners and 3794 salaried persons.

DETAILS AS TO COMPANIES.

The quantity of electricity generated by companies, other than railway, light railway, and tramway companies, amounted to 573,510,000 Board of Trade units; and the selling value of the electricity supplied to consumers or used in the works was returned as £3,182,000. This sum includes the value (£230,000) of electricity purchased from other companies and from local authorities; but, as the purchases from companies and from local authorities are not distinguished, the precise amount of duplication in the value of the output of electricity supply companies cannot be determined.

Companies who themselves generated all the electricity they supplied, and whose output amounted to 338,211,000 units, or 59 per cent. of the total output of electricity supply companies, furnished particulars as to the purposes for which the electricity was used; and the details are given in the following statement:—

	Units.
Public lighting	4,921,000
Private lighting	59,060,000
Traction	116,433,000
Power	59,314,000
Public and private lighting, power, and traction, not separately distinguished	12,243,000
Supplied in bulk to authorized distributors	39,491,000
Total quantity sold	291,462,000
Used in works	19,350,000
Total quantity supplied	310,812,000
" " generated	338,211,000

The difference between the quantities generated and supplied amounts to about 8·1 per cent., and is mainly attributable to losses in transmission.

Particulars were also obtained from companies who generated 65,495,000 units and purchased 29,848,000 units; and the purposes for which they supplied electricity are shown below:

	Units.
Public lighting	2,757,000
Private lighting	28,914,000
Traction	33,012,000
Power	11,295,000
Supplied in bulk to authorized distributors	3,495,000
Total quantity sold	79,473,000
Used in works	6,045,000
Total quantity supplied	85,518,000
" " generated and purchased	95,343,000

The transmission and other losses shown in this group amounted to 10·3 per cent. of the electricity generated and purchased.

Particulars as to the purposes for which electricity was supplied were not obtained from companies who generated 169,804,000 units (or nearly 29·6 per cent. of the total quantity generated by companies) and purchased 3,074,000 units.

As in the cases of the gas and water undertakings, the working staff of companies engaged in the generation of electricity is not employed solely in the operation of the generating plant, but also in works of construction, alteration, and repair in connection with the buildings, engines, machinery, apparatus, mains, &c. The cost of such work, whether immediately met out of capital or out of revenue, forms eventually a charge on the value of the electricity supplied. Consequently, it has not been taken as an addition to the output of electricity undertakings, in the meaning in which that term has been used for the purposes of the census. A summary of the particulars furnished in respect of the cost of such work done in the censal year (covering wages, materials, and establishment charges attributable to the work) is shown below; work given out to contractors not being included.

TABLE *showing Work done by Employees of Companies.*

	Construction.	Alteration and Repair.	Total.
A.—On generating stations—			
Buildings	£34,000	£16,000	£50,000
Engines, boilers, &c.	54,000	61,000	115,000
Machinery, instruments, and tools	38,000	75,000	113,000
Buildings and machinery, not separately distinguished	1,000	3,000	4,000
Total for generating plant	£127,000	£155,000	£282,000
B.—On distributing plant—			
Mains of all kinds	£252,000	£37,000	£289,000
Transformers, meters, switches, fuses, and other apparatus on consumers' premises	82,000	45,000	127,000
Apparatus at distributing stations	27,000	14,000	41,000
Mains, machinery, and apparatus, not separately distinguished	8,000	4,000	12,000
Total for distributing plant	£369,000	£100,000	£469,000
C.—Public lamps	£4,000	£20,000	£24,000
D.—Work not separately distinguished	—	—	16,000
Total of C and D			£40,000
Total cost of work done			£791,000

The net output of the electricity undertakings conducted by companies was £1,996,000; this sum representing the total amount by which the selling value of the electricity supplied exceeded the cost of the electricity purchased or used in works and of the fuel and other materials employed in the generation of electricity and in the execution of works of construction, alteration, and repair. Part of the electricity purchased was produced by certain companies in whose returns it figures as "output," and was sold to other companies in whose returns it figures as "materials" and as "output." Accordingly, the actual cost of materials used (including the electricity purchased from local authorities) cannot be stated; but it may be estimated at a sum lying between £956,000 and £1,186,000.

The average number of persons employed on the last pay-days in January, April, July, and October, in connection with electricity undertakings conducted by companies, is returned as 8499—viz., 6832 wage-earners and 1667 salaried persons; the total number being distributed by age and sex as follows: Males under 18, 456; over 18, 7954. Females under 18, 5; over 18, 84.

DETAILS AS TO PUBLIC AUTHORITIES.

Output.—The quantity of electricity generated by local and other public authorities amounted to 856,559,000 Board of Trade units, and the selling value of the electricity supplied to consumers or used in the works was returned as £5,721,000. This sum includes the value (£105,000) of electricity purchased from other local authorities or from companies; but, as the purchases from local authorities and from companies are not distinguished, the precise amount of duplication in the value of the output of public authorities cannot be determined.

Public authorities who themselves generated all the electricity they supplied, and whose output amounted to 704,785,000 units, or 82·3 per cent. of the total output of electricity undertakings operated by public authorities, furnished particulars as to the purposes for which the electricity was used; and the details are given in the following statement:

	Units.
Public lighting	44,386,000
Private lighting	173,108,000
Traction	226,540,000
Power	139,985,000
Public and private lighting, power, and traction, not separately distinguished	4,909,000
Supplied in bulk to authorized distributors	5,009,000
Total quantity sold	593,937,000
Used in works	47,092,000
Total quantity supplied	641,029,000
" " generated	704,785,000

The difference between the quantities generated and supplied amounts to 9 per cent., and is mainly due to losses in transmission.

Particulars were also obtained from public authorities who generated 70,018,000 units and purchased 14,022,000 units; and the purposes for which they supplied electricity are shown below:—

	Units.
Public lighting	1,994,000
Private lighting	5,381,000
Traction	60,493,000
Power	6,213,000
Public and private lighting, not separately distinguished	157,000
Supplied in bulk to authorized distributors	109,000
Total quantity sold	74,347,000
Used in works	1,647,000
Total quantity supplied	75,994,000
" " generated and purchased	84,040,000

The transmission and other losses shown in this group amounted to 9·6 per cent. of the electricity generated and purchased.

Particulars as to the purposes for which electricity was supplied were not obtained from public authorities who generated 81,756,000 units (or about 9·5 per cent. of the total quantity generated by public authorities) and purchased 20,000 units.

As already explained in the case of companies, the working staff is engaged not only in the operation of the generating plant, but also in works of construction, alteration, and repair in connection with the buildings, engines, machinery, apparatus, mains, &c. The cost of such work has not been taken as part of the output of the undertakings. But a summary of the particulars furnished in respect of the cost of such work (covering wages, materials, and establishment charges attributable to the work) is given below; work placed with contractors not being included:—

TABLE *showing Work Done by Employees of Public Authorities.*

	Construction.	Alteration and Repair.	Total.
A.—On generating stations—			
Buildings	£26,000	£37,000	£63,000
Engines, boilers, &c.	14,000	144,000	158,000
Machinery, instruments, and tools	69,000	213,000	282,000
Buildings and machinery, not separately distinguished	2,000	23,000	25,000
Total for generating plant	£111,000	£417,000	£528,000
B.—On distributing plant—			
Mains of all kinds	£500,000	£113,000	£613,000
Transformers, meters, switches, fuses, and other apparatus on consumers' premises	74,000	57,000	131,000
Apparatus at distributing stations	19,000	26,000	45,000
Mains and machinery, not separately distinguished	55,000	33,000	88,000
Total for distributing plant	£648,000	£229,000	£877,000
C.—Public lamps	£10,000	£105,000	£115,000
D.—Work not separately distinguished	—	—	11,000
Total of C and D			£126,000
Total cost of work done			£1,531,000

The net output of the electricity undertakings conducted by public authorities was £3,572,000; this sum representing the total amount by which the value of the electricity supplied exceeded the cost of that purchased or used in the works and of the fuel and other materials used in the generation of current and in the execution of works of construction, alteration, and repair. Part of the electricity purchased was produced by certain local authorities in whose returns it figures as "output," and was sold to other local authorities in whose returns it figures both as "materials" and as "output." Accordingly, the actual cost of materials used (including the electricity purchased from companies) cannot be stated; but it may be estimated at a sum lying between £2,044,000 and £2,149,000.

The average number of persons employed on the last pay-days in April, July, and October, 1907, and January, 1908, in connection with electricity undertakings conducted by public authorities is returned as 14,119—viz., 11,992 wage-earners and 2127 salaried persons; the total number being distributed by age and sex as follows: Males under 18, 457; over 18, 13,559. Females under 18, 2; over 18, 101.

Birmingham Corporation and Local Ironmongers.—At the monthly meeting of the Birmingham and District Ironmongers' Association last Tuesday, the President (Mr. J. H. Meakin) announced the receipt of a letter from the General Secretary with reference to the agreement entered into between the Birmingham Master Gas Fitters' Association and the Gas Department of the Corporation, and asking if the ironmongers of Birmingham were to participate in any of the concessions embodied in the agreement. Mr. H. Smith said he did not think they would benefit. He was actually worse off than before, as was shown by the fact that in 1908 he fixed 27 cookers, whereas last year he only fixed three. They had not been asked to fix a single warming-stove. The only inquiries he received related to work which was expected to be done for nothing. Mr. E. M. Hirst said it was improbable that they would ever get the Corporation to abandon their present policy of letting out cookers and stoves on the hire-purchase or permanent-hire system, as the advantages of this policy to the general public were too manifest. They might, however, press for differential rates for gas consumers; so that those who did not trouble the department about gas-fittings or gas-stoves, but provided their own, should get their gas at a lower price than those who had their fittings provided by the Corporation. It was decided that the Association should continue their attack on the policy of the Gas Department.

THE SOOTFALL OF LONDON.

Appeal by the "Lancet" for Soot-Gauge Observations.

In the early part of the year 1910, Dr. H. A. Des Vœux, the Honorary Treasurer of the Coal Smoke Abatement Society, and Dr. J. S. Owens, Assoc.M.Inst.C.E., consulted the Laboratory Commissioners of the "Lancet" in regard to making some experiments in the direction of estimating the matters deposited from London atmosphere at regular intervals over a period of a year at various stations in the Metropolitan area. A scheme was eventually formulated; and the first serious experimental observations were made on June 13, 1910. The experiments were conducted at four stations—two situated in the south-west district, near Westminster; one in the City area; and the fourth on the borders of the Metropolitan area at Sutton, in Surrey. The last station was chosen in order to obtain a comparison between the amount and kind of deposit falling in the suburban area and that collected in London itself. The collections were made each month through the year June-May, 1910-11, and at each station there was installed a soot-gauge which caught both deposit and rain. The analysis of these collections was conducted in the "Lancet" laboratory; and the results were tabulated in a recent issue. They were summarized in columns showing: Rain volume; total deposit fallen on an experimental area of 4 square feet (the soot-gauge); insoluble deposit (soot, &c.); total solids dissolved in the rain; soluble volatile solids; soluble fixed solids; sulphates; ammonia; chlorine in chlorides; lime; total deposit per square mile and calculated total deposit in the Administrative County of London, including the 117 square miles of the City.

In the course of the summary of the results, it is pointed out that the figures in the sulphate column are of particular interest, inasmuch as most, if not all, of the sulphur found in the rain may be traced to the combustion of coal and gas. The City area receives a much larger amount of sulphates than the south-western district—nearly double as much; while in the suburban area there were occasions when sulphates were present only in traces, or were not present at all. The maximum fall in the case of the City area occurred in October, November, and December, when there was fog; while the minimum amount was in September, and generally during the summer months. In the south-western district, the maximum occurred in the same autumn and winter period, and the minimum again in the summer months. In the suburban district, the maximum fall of sulphate occurred in December, while there were only traces present when elsewhere the fall was considerable.

Another interesting column is the one containing the figures for ammonia, because this is a product of the faulty combustion of coal; while coal gas, which is free from ammonia, yields none on combustion, even when this has been imperfect. The City area again receives the largest amount of ammonia in the rainfall; the south-western district comes next with about three-fourths the quantity, while in the suburban area over the year the amount was about one-twentieth of what fell in the Metropolis. The maximum fall in the City district occurred in March and April, when there were snow showers; but the figure was also high in the foggy period—November and December. The minimum occurred in September. In the south-western district, the results were much the same; while in the suburban district on eight occasions the amount of ammonia was inappreciable, even when there was snow.

It is pointed out that, as a rule, the rain water falling in the Metropolis is scarcely ever acid, in spite of its load of impurities, This point is of some importance, since it is generally reported in regard to the rainfall of Provincial cities, such as Manchester, Leeds, and Glasgow, that the water is invariably acid. London has no foundries, chemical works, or large power installations comparable with these places; and the inference is that the domestic coal-fire keeps the rainfall of London neutral, or if anything slightly alkaline, with the ammoniacal tarry compounds of the smoke. In large manufacturing towns, the blast-furnaces of industry, in which the fuel is more or less completely burnt, swamp the alkalinity of the domestic fire with their acid emanations. With regard to domestic heating, it is stated that if gas were entirely substituted for coal in London, the rain probably would be no longer neutral or slightly alkaline, but acid, because ammonia would then no longer be evolved from the domestic fire. This is said to be an advantage in considering the effects of the sootfall.

It is pointed out that the last column of figures in the table deals with some stupendous facts. If, for example, the City station is taken as the basis of calculation as to the total amount of deposit falling annually upon the Administrative County of London, including the City, this deposit amounts to no less than 76,050 tons, in which are present over 6000 tons of ammonia, about 8000 tons of sulphates, and 3000 tons of chlorine in chlorides, to say nothing of the carbon and tar. Taking the South-Western Metropolitan station as a basis, the total deposit per year over the same administrative area would average 53,820 tons, in which are present upwards of 4000 tons of ammonia, about 5000 tons of sulphates, and 4000 tons of chlorine in chlorides.

In conclusion, it is remarked that the soot-gauge discloses in a striking way the defects of the coal-fire; and it is urged that such an instrument of observation should be added to the equipment of the meteorological stations of towns and cities. A measure would thus be gained of the black carbonaceous deposit evolved from the chimney, which is an evidence of faulty combustion and wastage of fuel.

The staff and employees of the Stafford Corporation Gas and Electricity Department held their first annual dinner on the 6th inst.—Mr. W. M. Valon, the Gas Engineer and Manager, presiding. The members of the Gas and Electricity Committee had been invited; and Colonel Wright, the Chairman, referred to the profit bonus scheme in operation at the works; remarking that they wished to be model employers, and that the employees should benefit by the scheme.

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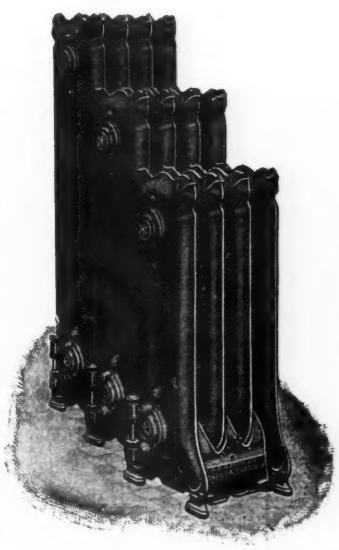

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ADDITIONAL LAND FOR THE BEDFORD WATER-WORKS.

Arbitration Proceedings.

On Tuesday and Wednesday last week, Mr. A. SAVILL sat as Arbitrator to determine the amount of compensation to be paid to Messrs. Despard and Handley and the Executors of the late Rev. Philip Beckett by the Bedford Corporation for the compulsory acquisition of the Fairhill Brickyard and adjoining land.

Mr. BALFOUR BROWNE, K.C., who represented the claimants, explained that in 1904 the Corporation sank two wells on land adjoining that which was now sought to be acquired. In 1906, at a Local Government Board inquiry, the question was raised as to whether the water supply would be polluted by the brickyard; but at the time it was stated that between the properties a fault was running which protected the water supply. Mr. Despard was negotiating for the purchase of the brickyard in 1908; but the Rev. P. Beckett, the owner, believing that the Corporation would buy it, declined his offers. It appeared that the Local Government Board Inspector had made experiments by putting coloured matter into the water in the brickyard, and it was found that it got into the wells. Mr. Despard renewed his offer to purchase; and Mr. Beckett again offered the land to the Corporation, who on Nov. 3, 1909, declined to have it. On the 11th of November, Mr. Beckett accepted Mr. Despard's offer of £8500 for the brickyard of five acres, with the movable stock at a valuation. Next day the Corporation gave notice to acquire the property compulsorily; and in August, 1910, their Provisional Order, giving them power to do this, was confirmed by Parliament. Formal offers were made for the property and not accepted; and hence the arbitration.

Mr. *Herbert T. Eve*, gave evidence in regard to his valuation of the property and interests; and his figures put Mr. Despard's claim at £9702, and Mr. Beckett's at £4278.

Other evidence was called; but before the case for the claimants was concluded, the parties conferred in private, and it was announced that satisfactory terms had been arranged.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Falkirk Town Council are perturbed over the best means of opposing the Linlithgow and Falkirk District Electric Lighting Provisional Order, under which it is considered the Council's gas undertaking in villages round about the burgh would be prejudicially affected. The advice of Mr. Balfour Browne, K.C., who has been consulted, is that the Town Council should promote another extension scheme. There is a strenuous feeling in Corporation circles that the proposed Order should be effectively opposed. A meeting of the ratepayers is to be held, when the whole question will be thoroughly ventilated. The Linlithgow Town Council have agreed not to oppose the Order.

At the meeting of the Dumfries Town Council on the 4th inst., on the motion of Provost Thomson, an important minute of the Gas Committee was adopted. This was to the effect that in future the Gas Manager should be relieved of all financial responsibility, that the whole clerical and financial staff remain at the gas office as hitherto, that Mr. Robert Reid (at present gas collector) be appointed cashier, that an apprentice be taken upon a four-years engagement, and that a gas collector be appointed in room of Mr. Reid. A petition that had been sent to the Provost by the firemen employed at the gas-works, asking that a deputation should be received by the Town Council, was ordered in the first place to be submitted to the Gas Manager. The cost of the lighting of Dumfries by public lamps for the current year is £647 11s. 8d. An improvement has been made with the lighting at the Burns statue, and further improvements are being carried out.

The Corporation of Glasgow are to supply free gas-cookers. This decision was arrived at by 44 votes to 17 at Thursday's meeting of the Corporation, after a long and animated debate. Bailie Paxton, in submitting the minutes of the Gas Committee, which recommended that this should be done, said there were many reasons why the use of gas-cookers should be granted free to consumers. The first was that there was a desire on the part of the citizens for a purer atmosphere; and a second was that it would employ their larger gas-works staff in summer as well as in winter. It would increase employment during the off-season to a very deserving class of workers. There was also a growing desire for a better, cleaner, quicker, and handier means of cooking, particularly among the working class, who, in many cases, at meal hours had little time to kindle fires. The Committee had made the fullest inquiry at three of the many gas undertakings that supplied cookers free—viz., Dundee, Paisley, and Manchester—and in these places they found the authorities more than satisfied with the results, even from a profit-earning standpoint. Bailie Kirkland seconded, and said the object of the Committee was to sell more gas. They were not going forward with the idea of giving something for nothing. He hoped the proposal would be adopted, because he believed it would go a long way to purify the air and bring increased returns to the department. Mr. Willock moved, as an amendment, that the minutes be remitted to the Committee. Bailie Smith seconded. Mr. Macnaughton was of the opinion that if they lent stoves free they must be making some part of the business pay for it. Mr. Montgomery submitted figures showing that among those corporations and companies who had tried the proposal of the Gas Department, it was justified. In the course of the subsequent discussion, the arguments of Bailie Paxton and Bailie Kirkland were not seriously assailed; and eventually, by the substantial majority stated, the proposal was adopted.

After a long discussion at the meeting of the Arbroath Town Council on Monday, it was agreed to increase the salary of Mr. A. C. Young, the Gas Manager, from £300 to £350 per annum. The increase was

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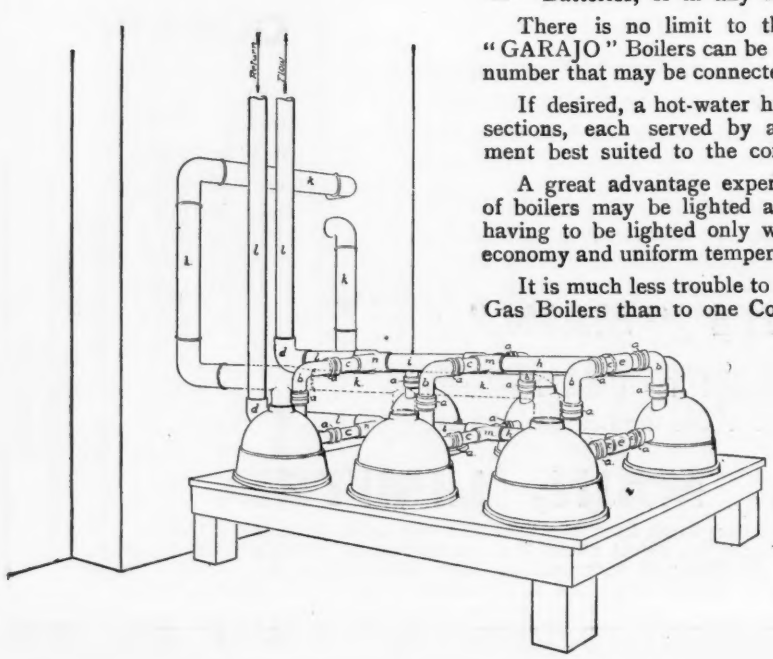

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A great advantage experienced with batteries is that any number of boilers may be lighted according to the weather, the full number having to be lighted only when the weather is severe. This ensures economy and uniform temperature.

It is much less trouble to attend to a battery of twenty "GARAJO" Gas Boilers than to one Coke Boiler.

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granted by 12 votes to 6. Treasurer Thomson, in moving that the increase should be granted, referred in terms of warm eulogy to Mr. Young's services. During his stay in Arbroath, Mr. Young had, he said, practically rebuilt the gas-works, bringing them up to the most modern requirements, without even adding a penny to the bonded debt—paying the whole sum out of current account. They knew he was a good manager and a good business man; and when they understood that Mr. Young had brought the price of gas down from 4s. 4½d. to 2s. 6d. per 1000 cubic feet, and had paid something like £18,000 and £19,000 out of the profits to make their works as good as any in Scotland, he thought the increase was well deserved. Mr. G. R. Wallace seconded, and also spoke of the ability and capacity of Mr. Young.

The Dunfermline Town Council, at their monthly meeting on Monday, agreed, on the recommendation of the Gas Committee, to spend £1200 in the provision of a bench of four vertical retorts for their works. A discussion took place as to the recommendation to purchase a piece of ground in Canmore Street, at a cost of £700, for the purpose of providing space for a new show-room, workshop, and store. Eventually, objection to the proposal was withdrawn, and it was resolved to proceed with the buildings, at an estimated cost of £1200.

At an organizing meeting of the National Gas Workers' Union held at Kirkcaldy on Tuesday evening, it was stated that pressure had been brought to bear upon at least one employer of labour in the town, with the result that the men who were being paid 17s. 6d. per week were to receive £1 per week; while their hours of labour had been reduced from 60 to 56 per week.

As the result of an explosion of gas on Monday evening in a dwelling-house at 5, Kirkwood Place, Abbeyhill, Edinburgh, Andrew Bain and Peter Rourke were detained at the Royal Infirmary suffering from burns and shock. The police information regarding the occurrence is that the two men, who both reside at the address stated, were fitting up a pulley in Rourke's house, and in putting in nails they apparently pierced a gas-pipe. It appears that they were searching for the escape of gas with a lighted match when the explosion occurred.

Provost Rose presided at a meeting of the Buckhaven Town Council on Monday, when a motion by Bailie Taylor, that a Committee be appointed to report on the question of municipal gas-works, was adopted. He pointed out that the burgh was served by two outside Companies, and they would have the benefit of works in the borough and cheaper gas if they decided to erect works of their own.

The Innellan Vigilance and Improvement Committee, on a requisition from a public meeting of the ratepayers, have approached the Dunoon Town Council, who last year purchased the undertaking of the Innellan Gaslight Company, as to their terms for lighting the streets of the village. The Council have offered to supply the gas necessary at the rate of 4s. 5d. per 1000 cubic feet per lamp per annum.

The question of the supply of gas to the Barassie Garden Suburb has been discussed by the Troon Town Council. Mr. J. Harling Turner, Chamberlain to the Duke of Portland, has now been informed that the Town Council would grant a supply if he would pay 6 per cent. per annum on the cost of the pipes laid down, and allow the gas rate to be 5d. per 1000 cubic feet more than that charged in Troon.

The Local Government Board for Scotland have informed the Dingwall Town Council that, as the water supply has proved insufficient and of doubtful quality, they could not approve of any scheme that proposed to augment it. The Board also expressed the hope that they might be informed that the Local Authority had decided to go in for a scheme that would ensure for the burgh a supply of water not only ample in quantity, but of first-class quality.

At the meeting of the Denny and Dunipace Town Council on Tuesday, Mr. J. M'Donald, the Gas Manager, in the course of his monthly report, stated that all the service-pipes had been laid to the new district, and only the meters had now to be connected.

In the reference, in the first paragraph of last week's "Notes," to the salary of the Gas Engineer and Manager of the Corporation of Perth, for which the Town Council are inviting applications, it should have been stated that the figure was fixed at £350 per annum without reference to any advance. This agrees with the advertisement in the "JOURNAL."

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 13.

Sulphate of Ammonia.

There has been a buoyant feeling in the market over the whole of the past week, and steadily advancing prices have been realized for all parcels offered for sale. Foreign buyers, as well as those in the United Kingdom, seem to have now recognized the threatening aspect of affairs in the coal industry, and in consequence of this have been purchasing their earlier requirements without further delay. The closing quotations are £14 7s. 6d. to £14 8s. 9d. per ton f.o.b. Hull, £14 8s. 9d. to £14 10s. per ton f.o.b. Liverpool, and £14 10s. to £14 11s. 3d. per ton f.o.b. Leith. In the forward position, business has transpired at £14 10s. per ton f.o.b. good ports for January-April delivery, and at £14 8s. 9d. per ton for January-June. Manufacturers are now holding for more money, but it has not been reported that they have so far obtained any higher figure.

Nitrate of Soda.

There is rather better inquiry for this article, but values remain unchanged at 10s. per cwt. for ordinary and 10s. 3d. for refined quality on spot.

LONDON, *Jan.* 15.

Tar Products.

The markets for tar products remain firm. Pitch is in good demand, and slightly improved prices have been paid in some quarters. In 90 per cent. benzol, it is reported that business has been done for delivery over the whole of this year at lower prices. Solvent naphtha

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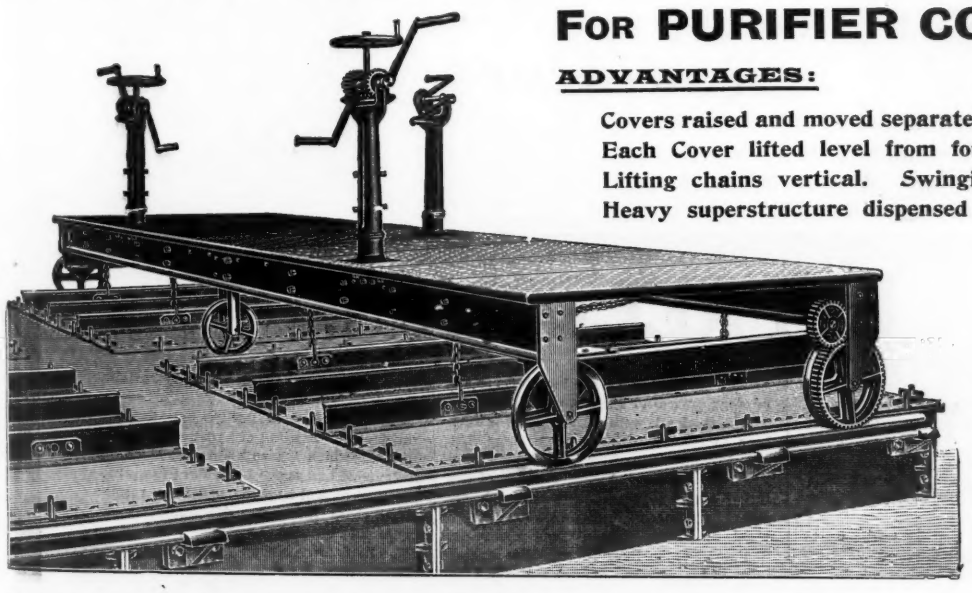


Prices and Particulars on Application.

London Office: 165, GRESHAM HOUSE, OLD BROAD ST., E.C.

is still fairly firm, and the inquiry is good. Creosote is in demand, and prices remain firm. The position of crude carbolic is about the same. A few contracts have been placed for delivery over the latter part of this year at the equivalent of 3s. per gallon for 60's.

The average values during the week were: Tar, 23s. to 27s. *ex* works. Pitch, London, 43s. to 43s. 6d.; east coast, 42s. 6d. to 43s.; west coast, Clyde 41s. to 42s., Manchester 41s. to 41s. 6d., Liverpool 42s. to 42s. 6d. Benzol, 90 per cent., naked, London, 11d.; North, 10½d. to 10½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 10d.; North, 8½d. to 9d. Crude naphtha, in bulk, London, 4½d. to 5d.; North, 3¾d. to 4¼d. Solvent naphtha, naked, London, 10½d. to 11d. f.o.b.; North, 9½d. to 9¾d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. 0½d. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 2⅞d. to 3¼d.; North, 2½d. to 2⅝d., salty; 2⅝d. to 2¾d., liquid. Heavy oils, in bulk, 3¼d. to 3½d. Carbolic acid, casks included, 60 per cent., east coast, 3s.; west coast, 3s. Naphthalene, £4 10s. to £10; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1½d. to 2d. per unit, packages included and delivered.

With regard to the price given in last week's report for London creosote, this should have been 2⅝d. to 3⅛d., and not 2⅜d. as stated.

Sulphate of Ammonia.

The improvement has been well maintained, and there is still a fair demand for January-April or January-June delivery. Actual Beckton make is quoted £13 18s. 9d. to £14. Outside London makes are £13 11s. 3d. to £13 12s. 6d.; Leith, £14 8s. 9d.; Liverpool, £14 6s. 3d. to £14 7s. 6d.; Hull, £14 5s.; Middlesbrough, £14 5s.

COAL TRADE REPORTS.

Northern Coal Trade.

With voting of miners in many places in favour of a strike, the northern coal trade is brisk and in some cases excited; and for moderate quantities of fuel needed early, high prices are quoted. The values depend, therefore, on the requirements of the users. In the steam coal trade, best Northumbrians have risen sharply, and may be quoted as about 13s. 9d. per ton f.o.b. Second-class steams are 11s. 6d. to 12s. per ton; and steam smalls are from 6s. to 7s. Large deliveries are, however, being made on contract, at lower figures; and thus the prices quoted are irregular, and vary more than usual. In the gas coal trade, the demand is strong to accumulate stocks; but the period of fullest consumption is now passing. Best Durham gas coals are very firm at perhaps 13s. to 13s. 3d. per ton f.o.b. But there is not much coal free for sale for early delivery; and for the surplus beyond the contract quantities, prices vary a good deal. Second-class gas coals are from 12s. to 12s. 6d. per ton f.o.b.; and "Wear specials" are about 14s. These prices are quoted; but sales are not very many, and are largely to allow a stock of coal to be accumulated. In coke, the tone is also firm. Good gas coke is from 15s. to 15s. 3d. per ton f.o.b. in the Tyne, with the possibility of some increase in this price.

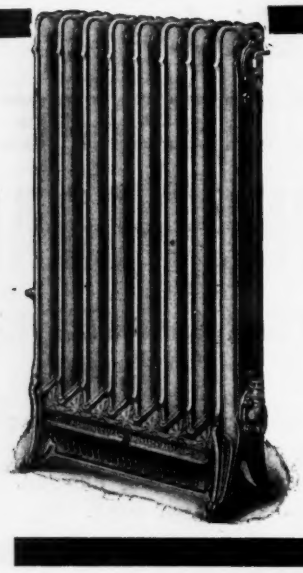
Scotch Coal Trade.

The coal trade continues to be fairly active, and at some pits—notably in the Lothians—the demand exceeds the supply. The feared imminence of a general strike is having an unsettling tendency in the export market. All kinds of small sized fuel is being eagerly taken up. The following prices may be quoted: Ell 11s. 9d. to 12s. 9d. per ton f.o.b. Glasgow (according to quality); splint, 12s. 3d. to 12s. 9d.; steam, 10s. 9d. to 11s. 3d. Quotations f.o.b. Leith are: Best screened steam coal; 11s. 1d. to 11s. 6d. per ton; second qualities, 10s. 6d. to 10s. 9d.; washed treble nuts, 11s. 3d. to 11s. 9d.; washed doubles, 9s. 9d. to 10s. 3d.; washed singles, 8s. 9d. to 9s. 3d.; rough dross, 6s. to 7s.

Cheltenham Electrical Affairs.

At a meeting convened by the Cheltenham Ratepayers' Association, to consider the proposal of the Corporation to seek power to extend the electrical supply to various rural districts, the Rev. W. H. Shaw (who presided) said the time had come when the ratepayers should refuse to allow the Corporation to speculate further with their money. General Babbage mentioned that he had entered an appeal against the decision of the Auditor on the subject of the extra charge put upon street lighting to meet the deficit on the electricity undertaking, on the ground that such charge was illegal and ought to be put on the rates. There was read to the meeting a petition which had been prepared against the Corporation proposals, setting forth various objections to the suggested extension of the Order. The chief were: "It appears that a loss is made from private lighting in the present area, and that without the enormous charge for lighting about a quarter of the town by electricity—viz., £9000 per annum—the electric light undertaking could not subsist. Until it can be clearly shown by the Corporation to the ratepayers of Cheltenham that the private lighting within the present area is carried on at a profit, we object to their going outside the present limit of supply for the purpose of private lighting. The area proposed to be added is so scattered that there is absolutely no justification for an extension, which can only be at the expense of the ratepayers of Cheltenham." Most of those present signed the petition.

Water-Works for Sale.—It will be seen, from an announcement which appears elsewhere, that Mr. William Richards (Messrs. A. & W. Richards) will offer for sale, at the Mart, Tokenhouse Yard, E.C., next Tuesday, the freehold water-works supplying Bloxham and East and West Adderbury, near Banbury, together with the mains, as a going concern. The sale is made by order of Mr. Justice Warrington; the concern being one of the ventures connected with the North Oxfordshire Water Company, Limited.



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"The Radiators are simply perfection."

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD., London and Warrington.

Extended Area of the Barnard Castle Gas Company.

In the paragraph describing the extension of the gas supply by the Barnard Castle Gas Company to the villages of Lartington and Cotherstone in last week's "JOURNAL" (p. 107), it should have been mentioned that the work had been carried out under the direction of the Company's Consulting Engineer, Mr. Joseph Hepworth (Edinburgh); and Mr. F. Priestman Lees, of Hexham, acted as Clerk of Works.

Sidmouth Gas and Electricity Purchase Question.

A meeting of ratepayers was held at Sidmouth on Friday night to discuss the question of the proposed purchase, by the Urban District Council, of the undertaking of the Sidmouth Gas and Electricity Company. Mr. T. Kennet-Were, the Chairman of the Urban District Council, presided over a large attendance, and explained the steps which had been taken leading up to the present position. Mr. J. G. H. Halse, a member of the Urban Council, proposed the following resolution: "That this meeting, as representing the electors of the urban district of Sidmouth, do, pursuant to the provisions of the Borough Funds Acts, 1872 and 1903, approve of the application of the Council in the next session of Parliament for an Act to confer upon the Council powers in relation to the supply of gas and electricity, and to enable the Council to acquire the undertaking of the Sidmouth Gas and Electricity Company." Mr. G. F. Budd seconded the resolution, and said he was convinced that the purchase of the undertaking would be a good investment on the part of the ratepayers. Mr. Tindall asked what the cost amounted to at the present time. Mr. Michelmore (Deputy-Clerk to the Urban Council) replied that, approximately, it was about £1000. The cost of the opposition was something like £700. After a good deal of discussion, the motion was carried by a large majority.

Cutting off Gas at Fires.

The Watch Committee of the Leeds Corporation last Friday decided to make an earnest appeal to occupants of business premises in the city to turn off their gas supply at the meter before leaving at nights or at the week-ends. It was also decided to recommend the placing of stop-taps at suitable places in the streets for the purpose of cutting off the supply in cases of emergency. Interviewed by a representative of the "Yorkshire Observer," the Chief Constable of Leeds (Major Tarry) explained that this action had been taken by the Committee as a result of the difficulty experienced by the firemen in coping with the outbreak of fire at a local newsagent's premises on the 7th inst. Several of the gas-pipes in the basement of the shop were melted by the heat; and, the escaping gas becoming ignited, all efforts to extinguish the fire in this part of the building for a long time proved futile. "This," said the Chief Constable, "has happened repeatedly. The firemen are constantly being handicapped by the ignition of gas at big fires. When the branch pipe from the main has been burnt through, the gas bursts out with a tremendous rush; and if it does not become ignited immediately, there is danger of explosion or of firemen being gassed." Major Tarry added that the Committee were strongly of the opinion that all premises of any magnitude where gas is used should be furnished with stopcocks just outside the building, in order that the gas supply might be cut off immediately on the arrival of the brigade.

An Electricity Committee's Treatment of a Gas Company.

A correspondent writes as follows: The Electricity Committee of the Hammersmith Borough Council lose no opportunity of hampering the enterprise of gas companies where it affords the public favourable opportunities of contrasting the illuminating power of gas with that of electricity. Recently the South Metropolitan Gas Company applied to the Council for permission to light their stand at the forthcoming Ideal Homes Exhibition at Olympia by means of gas taken from the ordinary mains. Application was also made, on behalf of certain exhibitors, to light their exhibits by their own plant, subject to a payment of 10s. 6d. per stand. These requests were brought before the Committee for consideration; and their conclusions are embodied in a report to come before the next meeting of the Council. In the course of it, it is stated that, in view of the Council's contract for the supply of electricity to Olympia, the Committee consider that there is no objection to the request of the electrical exhibitors, who make a speciality of supplying isolated country houses with installations being agreed to, "but they do not consider that the application of the South Metropolitan Gas Company is one which, in the circumstances, should be acceded to by the Council." The Committee recommended accordingly. In another portion of the report, the Committee express the opinion that it is of importance that the Council should offer facilities for wiring and the supply of fittings on hire, "in order to meet the requirements of consumers, and also to cope with the competition of gas-supply companies." It was impracticable, the Committee said, to submit a scheme fixing definitely the amount to be charged for hiring-out lamps and fittings for the interior lighting of houses; but they recommended the principle for lighting the interior of business premises in the borough by arc lamps and clusters of metal filament lamps on satisfactory terms.

Theft from a Gas-Works.—Before the Teignmouth Magistrates last Thursday, Robert Stone and Thomas Swift, labourers, were charged with stealing about 1 cwt. of lead and six flare burners, the property of Messrs. Robert Dempster and Sons, of Elland. Mr. J. A. Gray, the Manager of the Teignmouth Gas-Works, said the prisoners had been employed at the gas-works for Messrs. Dempster, who had been carrying out a contract there. The lead and burners were the property of the firm, and were left in his charge. A stoker at the works saw the prisoners loitering near the works; and other witnesses spoke to seeing them wheeling a barrow on which was a bag. Subsequently they sold the lead to a lodging-house keeper, and offered to sell him the burners. Both prisoners expressed sorrow for what they had done, and were sentenced to fourteen days' imprisonment.

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South Suburban Gas Company's Bill.—The Beckenham Urban District Council have appointed the representatives of the Shortlands Ward to attend any meetings of local authorities called to consider the provisions of the South Suburban Gas Company's Bill. They have been invited by Bromley to a conference on the matter,

Brighton and Hove Gas Bill.—The Town Clerk of Brighton, in a report on the Brighton and Hove Gas Company's Bill for establishing a benefit fund, remarks that the powers asked for would have the effect of postponing the time at which consumers would become entitled to a reduction in the price of gas under the sliding-scale arrangement. From this point of view, therefore, the proposal is, he says, objectionable.

Gas Prices and Gas Appliances.—Under this heading the "Ironmonger" last Saturday made the following remarks: "The fact that the Birmingham City Council have decided to reduce the price of coal gas to private consumers from 2s. 2d. to 1s. 11d. per 1000 cubic feet is likely to have an important effect upon the gas-fitting industry in the district; and coming as it does immediately upon the conclusion of the agreement with the Master Gas Fitters' Association, it is likely to be appreciated by the trade quite as much as by the general public. It is estimated that immediately the price of gas falls below 2s. per 1000 cubic feet, its economic value is equivalent to that of coal of average quality and price; while gas has the additional advantages of cleanliness and convenience. Hence many householders who have hitherto refrained from using gas warming and cooking stoves because of the extra cost of the fuel may now change their plans. We believe that the policy lately initiated by the Birmingham Gas Department of supplying and fixing gas-fires in private houses practically free of charge, subject to a nominal rental, has been immensely successful from the gas producers' and gas-fitters' point of view; no fewer than 6000 stoves of various sizes and qualities having been fixed already this season. But we should have been better pleased if these stoves had passed through the hands of legitimate dealers, instead of going practically direct from the manufactories to the users."

APPLICATIONS FOR LETTERS PATENT.

17.—Frain, J. S., Simpson, D. H., and Eaton, J. H., "Gas-making machines." Jan. 1.
34.—Hutchinson, C. H. & B. G., "Inverted burners." Jan. 1.
85.—Parrott, G., "Stop-valve." Jan. 1.
124.—Taylor, A. E., "Blow-lamp and gas-lamp combined." Jan. 2.
126.—Aminoff, G., "Gas-washer." Jan. 2.
152.—Cooke, H. S., "Lighting gas-lamps." Jan. 2.
157.—Feld, W., "Effecting the mutual reaction of sulphuretted hydrogen and sulphurous acid and the obtainment of sulphur." Jan. 2.
190.—Strachan, R. P., and Strachan and Henshaw, Ltd., "Electrically operated telphers." Jan. 2.
204.—Parker, C. H., "Continuous production of a smokeless fuel." Jan. 3.
205.—Ower, C., "Gas-fires." Jan. 3.
291.—Wood, W. H. L., "Controlling liquids or gases at a distance." Jan 4.
317.—Wilson, H. W., "Air-gas generators." Jan. 4.
415.—Williams, P. E., and M'Phee, N., "Charging retorts." Jan. 5.
430.—Strachan, R. P., and Strachan and Henshaw, Ltd., "Telpher tracks." Jan. 5.
446.—Glover, T., "Fuel for gas-fires." Jan. 5.
447.—Glover, T., "Back for gas-fires" Jan. 5.
482.—Lloyd, E. F., "Pressure-increaser." Jan 6.
519.—M'Farlane, C. S., "Production of gas from hydrocarbon oils." Jan. 6.

At a meeting of the Newcastle-under-Lyme Gas Committee, it was resolved that it be recommended that the charge for gas supplied to the electricity works should be at the rate of 10½d. per 1000 cubic feet—such charge to come into operation only in the event, and from the date, of new additional gas-engines being installed for the proposed extension.

GAS COMPANIES' STOCK AND SHARE LIST.

The Stock Exchange had not a cheerful time last week. Every incident of the period both at home and abroad was calculated to depress markets; and the chief among these was the threatening aspect of the labour question. Business was not active; the settlement of the fortnightly account helping to limit fresh enterprise. The opening was fair; but the tone was not maintained. Rails were at first buoyed-up by hopeful views as to the industrial unrest; but misgivings supervened, and prices gave way. Government issues were irregular; and Americans weak. Business was moderate on Tuesday; and, except in some special lines, the tendency was dull. Gilt-edged things were flat, and Consols fell. Rails were still oppressed by apprehension; while other leading departments were heavy. Wednesday was inactive, and all the chief markets were flat. Consols went a little lower. The Railway Market took a very grave view of the labour outlook, and prices fell accordingly. Americans gave way; but they closed above the worst. Thursday was at first quite dull. Government issues were weak; but Rails, after a depressing start, began to pick up. On Friday, Rails were still disposed to take a brighter view of strike threats, and continued their improvement. Consols were, however, flatter, and touched 76½. Saturday was a much brighter day. Business was better, and there was a marked amendment of tone. Consols advanced, closing at 76⅝ to 76⅞; and Rails were cheery and hopeful, in spite of the miners' ballot. In the Money Market, there was a very fair demand. Rates for both short loans and discount were firm almost up to the close. Business in the Gas Market was strong and active, although—as is not unfrequently the case—it was to a large extent restricted to the stocks of a few prominent undertakings. General steadiness and strength was the characteristic. In Gaslight and Coke issues, the ordinary was more than usually active, and continued to advance in value. Transactions ranged from 105⅛ to 106⅜—a rise of ⅛. In the secured issues, the maximum was repeatedly done at 85 to 86¼, the preference marked 104, and the debenture 79 and 80. There was much more business again in South Metropolitan, which changed hands at prices ranging from 116 to 117; and the debenture was done at 80 and 81 *cum div.* In Commercials, the only transaction was one in the debenture, at 76⅜. Among the Suburban and Provincial group, Brentford old was done at 261, ditto new at 202 and 202⅜, and Southampton at 108. In the Continental companies, Imperial was quiet and unchanged at 191 to 192½, ditto debenture was marked at 90¾, Union made 85 (a fall of 1), ditto preference 135¼, and European 21. Among the undertakings of the remoter world, Bombay changed hands at 6⅛, Buenos Ayres debenture at 94½ and 94¾, Cape Town preference at 5, Monte Video at 12¼, Oriental at 135¾, Primitiva at 7 7/16 to 7 9/16, ditto preference at 5 7/32 to 5 5/16 (a rise of 1/16), and San Paulo at 11.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 12	5	Alliance & Dublin Ord.	79—83	..	6 1 11
374,000	Stk.	Jan. 12	4	Do. 4 p.c. Deb.	91—93*	..	4 6 0
250,000	5	Sept. 28	7	Bombay, Ltd.	6—6½	..	5 7 8
50,000	10	Aug. 31	15	Bourne-) 10 p.c.	29—30	..	5 0 0
311,810	10	,,	7	mouth Gas) B 7 p.c.	16½—16¾	..	4 3 7
75,000	10	,,	6	and Water) Pref. 6 p.c.	14¼—14½	..	4 1 4
880,000	Stk.	Aug. 16	13	Brentford Consolidated	356—261	..	4 19 7
330,000	,,	,,	10	Do. New	198—203	..	4 18 6
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	217—222	..	4 19 1
246,320	,,	,,	8	Do. A Ord. Stk.	157—160	+1	5 0 0
490,000	20	Sept. 28	12½	British	44⅜—45⅛	..	5 9 11
120,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. Stk.	92—94	..	4 5 1
109,000	,,	Aug. 16	6	Bromley, A 5 p.c.	127—132	..	4 10 11
165,700	,,	,,	4½	Do. B 3½ p.c.	97—102	..	4 8 3
82,378	,,	,,	5½	Do. C 5 p.c.	117—122	..	4 10 2
55,000	,,	Dec. 29	3½	Do. 3½ p.c. Deb.	80—83	..	4 5 4
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4¼—5¼	..	—
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	76—80	..	5 12 6
157,150	Stk.	Aug. 16	5	Chester 5 p.c. Ord.	111—113	..	4 8 6
1,513,280	Stk.	,,	5/9/4	Commercial 4 p.c. Stk.	110—112	..	4 17 7
560,000	,,	,,	5½	Do. 3½ p.c. do.	105—107	..	4 19 8
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	75—77	..	3 17 11
800,000	Stk.	,,	4	Continental Union, Ltd.	84—88	−1	4 10 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	132—134	..	5 4 6
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
840,150	10	July 28	10	European, Ltd.	20—21	..	4 15 3
16,160,600	Stk.	Aug. 16	4/14/8	Gas-) 4 p.c. Ord.	105½—106⅜	+⅛	4 8 10
2,600,000	,,	,,	3½	light) 3½ p.c. max.	84½—86½	..	4 0 11
4,062,235	,,	,,	4	and) 4 p.c. Con. Pref.	102—104	..	3 16 11
4,531,705	,,	Dec. 14	3	Coke) 3 p.c. Con. Deb.	79—81	..	3 14 1
258,740	Stk.	Sept. 14	5	Hastings & St. L. 3½ p.c.	95—97	+1	5 3 1
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	17—17½	..	6 5 9
131,000	Stk.	Sept. 14	7½	Ilford A and C	154—157	..	4 15 6
65,780	,,	,,	6	Do. B	125—128	..	4 13 9
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
4,940,000	Stk.	Nov. 10	9	Imperial Continental	191—193	..	4 13 3
1,235,000	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	90—92	..	3 16 1

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	125—130	..	4 12 4
561,000	Stk.	Aug. 16	10	Liverpool United A.	219—221	..	4 10 6
718,100	,,	,,	7	Do. B.	163—165	..	4 4 10
306,083	,,	Dec. 29	4	Do. Deb. Stk.	100—102	..	3 18 5
75,000	5	Dec. 14	6	Malta & Mediterranean	4⅜—5	..	6 0 0
560,000	100	Oct. 2	5	Met. of) 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 10	3½	Monte Video, Ltd.	12—12½	..	5 12 0
1,775,892	Stk.	July 28	4½	Newc'tle&G'tesh'd Con.	102—103	+¾	4 5 0
529,705	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	85—87	..	4 0 6
55,940	10	Aug. 31	7/7/0	North Middlesex 7 p.c.	14½—15½	..	4 14 10
300,000	Stk.	Dec. 14	8	Oriental, Ltd.	134—136	..	5 17 8
60,000	5	Sept. 28	8	Ottoman, Ltd.	6⅞—7¼	..	5 10 4
31,800	53	Aug. 16	13	Portsea Island A	140—145	..	4 14 10
60,000	50	,,	13	Do. B	133—138	..	4 14 2
100,000	50	,,	12	Do. C	130—135	..	4 8 11
398,490	5	Oct. 12	8	Primitiva Ord.	7⅜—7⅝	..	5 4 11
796,980	5	Dec. 29	5	Do. 5 p.c. Pref.	5¼—5⅝	+1/16	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
312,650	Stk.	Dec. 29	4	River Plate 4 p.c. Deb.	94—96	..	4 3 4
250,000	5	Sept. 28	12	San Paulo, Ltd.	10¾—11	..	5 9 1
115,000	10	,,	6	Do. 6 p.c. Pref.	11⅝—12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49—50	..	5 0 0
135,000	Stk.	Aug. 31	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	239—241	..	4 3 0
523,500	,,	,,	10	Do. C	239—241	..	4 3 0
90,000	10	Sept. 28	6	South African	8—9	..	6 13 4
6,429,895	Stk.	Aug. 16	5/9/4	South Met., 4 p.c. Ord.	116—118	..	4 12 8
1,895,445	,,	Jan. 12	3	Do. 3 p.c. Deb.	78—80*	+½	3 15 0
209,820	Stk.	Aug. 16	8½	South Shields Con. Stk.	157—159	..	5 6 11
605,000	Stk.	,,	5½	S'th Suburb'n Ord. 5 p.c.	121—123	..	4 12 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	,,	Jan. 12	5	Do. 5 p.c. Deb. Stk.	119—121*	+½	4 2 8
502,310	Stk.	Nov. 10	5	Southampton Ord.	107—109	..	4 11 9
120,000	Stk.	Aug. 16	7½	Tottenham) A 5 p.c.	145—148	..	4 16 3
483,940	,,	,,	5⅝	and) B 3½ p.c.	115—117	..	4 16 1
149,470	,,	Dec. 29	4	Edmonton) 4 p.c. Deb.	94—96	..	4 3 4
182,380	10	,,	5	Tuscan, Ltd.	8½—9	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
236,476	Stk.	Aug. 16	5	Tynemouth, 5 p.c. max.	114—116	..	4 6 2
255,636	Stk.	Aug. 31	6¼	Wands-) 3½ p.c.	142—145	..	4 14 10
85,766	,,	Dec. 29	3	worth) 3 p.c. Deb. Stk.	71½—73½	..	4 1 8

Prices marked * are "Ex. div."

Under Gas Manager's Tragic Death.—Mr. Edward Clayton, Inside Manager at the Cloughfold works of the Rossendale Union Gas Company, met his death under tragic circumstances last Tuesday. In the early part of the afternoon, he was engaged directing operations from the top of the automatic coke-conveyors, when he slipped and fell to the ground, sustaining injuries from which he died almost immediately. Mr. Clayton had been in the service of the Company for many years, and lived at the gas-works cottage, to which the body was removed after the accident. At the inquest, which was held at Thursday, there was no clear evidence as to how the accident occurred, beyond the fact that Mr. Clayton fell from the platform of the conveyor to the ground below, a distance of about 40 feet. A labourer employed at the works said he was filling waggons when the accident happened. Witness was on the ground by the railway waggons; and he saw Mr. Clayton fall through the gangway head first. The Jury's verdict was one of "Accidental death." Mr. Clayton was 56 years of age.

The "South Wales Daily News" last Wednesday contained the following: "The Cardiff Gas Company have just completed a smart bit of work in fitting heating apparatus at the University College in Newport Road, Cardiff. On Friday morning, the system of heating in vogue at the college failed to operate; and the Gas Company were communicated with. The Company supplied forthwith 25 double-loop radiators of various sizes for heating the different rooms, all of which are fairly large. The same afternoon work commenced; and by Monday evening the whole scheme was complete. Besides fitting the radiators, new piping had to be run in many rooms, with fixing arrangements, &c.; but no inconvenience was experienced by the staff, and yesterday morning the new radiators were at work, with satisfactory results."

At an inquest at Rotherham, on the body of Fanny Whitaker, aged 85, who was found dead in bed, having been apparently poisoned by gas, the evidence given was to the effect that deceased had stopped all the ventilation in her bed-room, in order to keep out draughts. The assumption was that after she retired to bed one night, the chandelier in the room slipped down and there was an escape of gas which suffocated her in her sleep. The Jury returned a verdict of "Accidental death."

It will be seen, from announcements appearing elsewhere, that Messrs A. & W. Richards will resume next Tuesday, at the Mart, Tokenhouse Yard, E.C., their sales of gas and water stocks and shares. On the day named, they will offer new issues of capital for the Great Yarmouth and Southend Water Companies, and sell stocks and shares for the Senior Official Receiver and Liquidator of the Birkbeck Benefit Building Society, as well as for some Executors, in the Southend and Haywards Heath Gas Companies.

We have received from the Welsbach Company, Limited, of Gray's Inn Road, W.C., a 16-page mantle booklet they have just issued. It gives a few of the many reasons why gas should be used in preference to electricity (the most forcible of them being that the same candle power can be obtained for 1d. with the former which costs 4d. with the latter), furnishes a short account of the origin of the Welsbach mantle and of the process of its manufacture, and follows it up with a number of samples of the finished article. While directing attention to Welsbach mantles, the compilers of the pamphlet point out the evils of those of inferior quality which are on the market. On the cover is a space for the name of a gas company; and we learn that a copy is being sent to every undertaking in the United Kingdom, as well as being distributed freely to the ironmongery and gas-fitting trades. Accompanying the booklet was a new four-page leaflet showing samples of the Company's lamps for street and shop lighting.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Jan. 13. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.	
					Liverpool.	Manchester.
Tar, crude	per ton	—	22/6 27/-	23/6 27/6	—	—
Pitch	,,	44/-	42/9	43/9	40/6	40/-
Benzol, 90%	per gallon	1/2	1/0½	1/-	1/-	1/-
Benzol, 50-90%	,,	—	-/11	-/11	-/11	-/11
Toluol, 90%	,,	—	-/10½	-/11	—	—
Crude naphtha, 30%	,,	—	-/5	-/4½	-/5	-/5
Light oil, 50%	,,	—	-/4¾	—	-/4¾	-/4¾
Solvent naphtha, 90-160	,,	—	-/11	-/10½	—	—
Heavy naphtha, 90-190	,,	—	-/11	-/11	—	—
Creosote in bulk	,,	-/3¼	-/2⅝	-/2 9/16	-/2⅝	-/2⅝
Heavy oils	,,	—	-/2¾	-/2½	—	—
Carbolic acid, 60's	,,	—	3/1	3/3	—	—
Naphthalene, crude drained salts	per ton	—	45/-	42/6	47/6	47/6 50/-
,, pressed	,,	—	60/-	63/-	60/-	60/- 72/6
,, whizzed	,,	—	—	—	70/- 72/6	70/- 75/-
Anthracene	per unit	-/2	-/1½	-/1½	-/1¼	-/1¼

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

ASSISTANT. No. 5510.
BLACKSMITH AND GAS-WORKS FITTER. Bute Gas-Works.
SHOWROOM SALESMAN (Gas Undertaking). No. 5511.

Appointments Wanted.

CHEMICAL PLUMBER, &c. No. 5492.
COMMERCIAL MAN (with Investment if desired). No. 5503.

Meetings.

LEATHERHEAD GAS AND LIGHTING COMPANY. Swan Hotel, Leatherhead. Jan. 25. 5.30 p.m.
BROMLEY AND CRAYS GAS COMPANY. Bell Hotel, Bromley. Feb. 1. 6 o'clock.

Plant, &c. (Second Hand) for Sale.

RETORT HOUSE FITTINGS, CONDENSERS, EXHAUSTERS, WASHERS AND SCRUBBERS, PURIFIERS, METERS, WATER-GAS PLANT, ENGINES, BOILERS, SULPHATE PLANT, &c. Gaslight and Coke Company, Westminster, S.W.

Water-Works (Bloxham) for Sale. By Auction. (London Mart.) Jan. 23.

Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. By Auction. Jan. 30.
BRITISH GASLIGHT COMPANY. By Auction. Jan. 30.
BROADSTAIRS GAS COMPANY. By Auction. Jan. 30.

Stocks and Shares (*continued*).—

GASLIGHT AND COKE COMPANY. By Auction. Jan. 30.
GREAT YARMOUTH WATER-WORKS COMPANY. By Auction. Jan. 23.
HAYWARD'S HEATH GAS COMPANY. By Auction. Jan. 23.
HORNSEY GAS COMPANY. By Auction. Jan. 30.
ISLE OF THANET GAS COMPANY. By Auction. Jan. 30.
SOUTHEND GAS COMPANY. By Auction. Jan. 23.
SOUTHEND WATER COMPANY. By Auction. Jan. 23.

TENDERS FOR

Pipes, &c.

CLACTON URBAN DISTRICT COUNCIL. Tenders by Feb. 7.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1912, are reminded that this can only be done during the present month.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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"VOLCANIC" FIRE CEMENT.
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See Illustrated Advertisement, Dec. 5, p. 663.

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PATENTS AND TRADE MARKS
PUBLICATIONS: "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.: TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
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Correspondence invited.

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Address No. 5492, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF," THE COOKER CLEANER.
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SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
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36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
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Telephone: 1588 AVENUE (3 lines).

WANTED, a Good, Reliable, Black-SMITH and GAS-WORKS FITTER, thoroughly Competent to undertake any Smith or Repair Work on a Gas-Works Previous Experience indispensable.
Apply, by letter, stating Age, Experience, where Employed, and giving References, to the MANAGER, Bute Gas-Works, East Moors, CARDIFF.

WANTED, an Assistant for a Provincial Gas-Works making between 300 to 400 Millions. Must be rapid Draughtsman. Wages, £2 per Week.
Apply, on or before Jan. 23, giving full Particulars, to No. 5510, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Thoroughly Experienced SALESMAN for Chief Show-Room of a Large Provincial Gas Undertaking. Must be a Good Commercial Man, Smart, Active, and Thoroughly Conversant with all kinds of Gas Appliances, a Good Organizer and Disciplinarian.
Apply, stating Age, Experience, and Salary required, to No. 5511, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CLACTON URBAN DISTRICT COUNCIL.

TENDERS FOR PIPES.

THE above Council are prepared to receive TENDERS for the Supply and Delivery of about 70 Tons of British CAST-IRON PIPES and CONNECTIONS.
Copy of Specification and Form of Tender may be obtained from the Council's Consulting Engineer, Mr. Sydney Francis, A.M.I.M.E., Town Hall, Clacton-on-Sea.
Sealed Tenders, endorsed "Tenders for Pipes," to be Delivered to the undersigned not later than noon on Wednesday, the 7th of February, 1912.
The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall, Clacton-on-Sea,
Jan. 11, 1912.

THE GASLIGHT AND COKE COMPANY.

TENDERS FOR DISUSED GAS PLANT.

THE Directors of the Gaslight and Coke Company are prepared to receive Sealed TENDERS for the Purchase of a quantity of DISUSED GAS PLANT on the site of the Company's premises at Fisher Street, Barking, E., and at Woodford Bridge, Essex, comprising:—RETORT-HOUSE FITTINGS, CONDENSERS, EXHAUSTERS, WASHERS and SCRUBBERS, PURIFIERS, METERS, CARBURETTED WATER-GAS PLANT, DELLWICK BLUE-GAS PLANT, AMMONIUM SULPHATE PLANT, PUMPS and ENGINES, TANKS, BOILERS, and MISCELLANEOUS items, in accordance with the Terms and Conditions of Specifications and Forms of Tender to be obtained at the Chief Office of the Company, as below.
Tenders for the Whole or for any Portion of the Plant Specified to be sent in not later than Nine o'clock a.m. on Friday, the 2nd prox., addressed to the undersigned and endorsed "Tender for Disused Gas Plant, Barking (or Woodford)."
The Directors do not bind themselves to accept the Highest or any Tender, and reserve to themselves the right of accepting the Whole or a Portion only of any one Tender.

By order,
HENRY RAYNER,
Secretary.

Chief Office, Horseferry Road,
Westminster, S.W., Jan. 11, 1912.

EUROPEAN GAS COMPANY LIMITED.

NOTICE is Hereby Given to Holders of SHARE WARRANTS TO BEARER that an INTERIM DIVIDEND of Five per Cent.—viz.: Ten Shillings per Share—will be paid, free of Income-Tax, on the 1st of February next. This payment, is however, subject to a deduction of 7d. per Share for French Stamp and Transfer Duty.
Payment will be made at the Union of London and Smith's Bank, Limited, 2, Princes Street, London, E.C., after Serial Coupon No. 74 has been left there Three Clear Days for Examination.
AND NOTICE IS HEREBY FURTHER GIVEN, that the TRANSFER BOOKS WILL BE CLOSED from the 15th to the 23rd inst., both days inclusive.

W. B. BRADY,
Secretary.

Finsbury House, Blomfield Street,
London, E.C., Jan. 10, 1912.